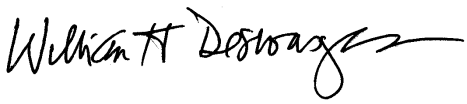
Expert Report:
***City of Spokane v. Monsanto Company, et al.*,**
Case No. 2:15-cv-0201-SMJ
United State District Court, Eastern District of Washington

Prepared by:



William H. Desvousges, Ph.D.

W.H. Desvousges &
Associates, Inc.

168 Spartina Ave.
St. Augustine, FL 32080

November 15, 2019

TABLE OF CONTENTS

1. SUMMARY AND QUALIFICATIONS

Counsel for the defendants has requested that I evaluate the City's claim that PCBs have affected the beneficial uses of the Spokane River (River) in the City of Spokane. I have a Ph.D. and Master of Science Degree in Economics from Florida State University, and a Bachelor's Degree in Economics from Stetson University. I have held faculty positions in Missouri and in North Carolina, including a research professorship at Duke University in Durham, NC.

I have been conducting economic valuation research for more than 35 years, especially related to environmental matters. (A complete resume is included in Appendix A.) I have extensive experience in natural resource damage assessment (NRDA), having worked on more than 35 assessments since 1987, after I wrote the economics handbook for the Department of Interior (DOI) to accompany the 43 CFR Part 11 regulations. It is these regulations that describe methods for evaluating injuries, services losses and damages for impacted uses of natural resources from hazardous substance releases. I have led major damage assessments for the hazardous-substance releases into the Clark Fork River (MT), Lavaca Bay (TX), and Fox River (WI). Other major assessments include: Shell Martinez spill, *Exxon Valdez* spill, the *Deepwater Horizon* spill, Housatonic River, Saginaw Bay and River, and South Valley. I addressed potential human use losses for the Coeur d' Alene site in Western Idaho as part of the ASARCO bankruptcy proceedings and testified in Federal Court on my findings. I am currently working on a damage assessment for potentially impacted recreation uses at a site in the Cascade Mountains in Washington.

Additionally, I have been involved in numerous property diminution studies, especially ones involving environmental concerns. These studies have used state of the art research methods and market data to evaluate the potential impacts of various substances including PCBs, DDT, and perchlorate. I have conducted these studies in various locations throughout the United States. I was also admitted as an expert in both

Federal and State Courts, including the States of Alaska, New Jersey and Massachusetts.[1]

I also have been actively involved publishing in the peer-reviewed literature based on my research. I have co-authored four books and 65 articles. I have conducted research grants for the National Science Foundation and the U.S. Environmental Protection Agency (USEPA). I have also served as an Associate Editor for two environmental economics journals and have served as peer reviewer for numerous economics journals. I am a member of the Association of Environmental and Resource Economists as well as the American Economics' Association.

To evaluate the alleged impact of PCBs on the beneficial uses of the River near Spokane, Washington, I visited the area. I followed the River from Lake Coeur d'Alene in Idaho to Long Lake. I rafted through portions of the River. In addition, I have reviewed numerous documents that were produced in discovery by the City and other parties and the City's 30(b)(6) deposition testimony. I have also conducted a thorough review of the literature related to the uses of the River, including the recreational, commercial and industrial uses. Among other documents, I have reviewed filings prepared by Avista, the local electric company, for the Federal Energy Regulatory Commission on the recreational uses of the River. I have reviewed numerous planning documents prepared by the City and other regional planning entities. To understand the information that potential users of the River may have available to them about the uses of the River, I have searched various Internet sites, Instagram and the Spokesman Review. I have also reviewed various documents from the professional economics literature. I also have reviewed the expert report prepared by the plaintiff's expert, Dr. J. Michael Trapp, and various depositions related to my testimony.

[1] *State of Alaska and City of North Pole v. Williams et al.; New Jersey Department of Environmental Protection, et al. v. Union Carbide Corporation; New Jersey Department of Environmental Protection, et al. v. Essex Chemical Corporation; Matter of DeLeo, et al. v. Bouchard Transportation Co., et al.*

Summary of Opinions

I have concluded that there is overwhelming evidence showing that PCBs have not obstructed the free use of the River. In addition, the evidence clearly shows that the enjoyment of recreational swimming, boating, fishing and other water activities has not been affected by PCBs.[2] Moreover, there is no evidence that PCBs interfere with the free use of the River for the promotion of commerce, navigation and fisheries. Finally, the main limitation to use continues to be conventional water quality pollutants associated with the City's combined sewage outfalls.

Opinion 1: The City is not a Trustee for the Spokane River, or the resources within it or the uses it supports.

The nuisance claim by the City for a reduction in beneficial uses of the River as a result of PCBs is comparable to a claim for natural resource damages. Only a Trustee of a resource may claim natural resource damages as a result of an injury and loss of natural resource services (43 CFR Part 11). A NRDA requires the participation of all relevant natural resource Trustees as specified in 43 CFR Part 11 regulations for conducting a NRDA. Such an assessment would require an evaluation of the reduction in natural resource services that have occurred as a result of an injury to the resource. This loss in services would then be equated with a corresponding gain in natural resource services resulting from compensatory restoration projects. These projects would restore the equivalent services lost as a result of the injury, making the public whole. Neither the City, nor its experts, have done any such analysis of lost natural resource services. Finally, the City's own witness concurs that the City is not a Trustee of the Spokane River or the resources within it (Feist 2019, 653-654 and 894-895).

[2] I have reviewed hundreds of photos on Instagram showing the extent and variety of uses of the River. People's enjoyment is evident in the photos.

Opinion 2: The overwhelming evidence demonstrates that PCBs have not affected the recreational use of the Spokane River.

The River provides many recreational opportunities for both residents and visitors. The River flows through the middle of the City, yielding spectacular views of fast-moving water and unique natural features. Many parks and tourist attractions are located on or near the River. Riverfront Park, which is in the midst of a major renovation and expansion by the City, supports 2.2 million users per year (Riverfront Park Master Plan 2014). This renovation is part of a $60 million-dollar bond program that the City has financed with the Riverfront Park efforts being the center piece. According to Spokane Mayor David Condon, the River is once again firmly implanted as Spokane's identity (Hill 2018).

Several studies have been undertaken of people who live on or near the River. These studies show that the River supports many water-based activities including fishing, swimming, kayaking, paddle boarding, and rafting. Near water activities, such as hiking and walking, are also popular among both visitors and residents. Users are assured that the River is safe for recreational use. For example, even five years ago, Brook Beeler, Communications Manager for the Department of Ecology's Eastern Region office, emphasized that the River is safe to swim and recreate in (Silbernagel Mccaffree 2014).

Fishing takes places at numerous access points along the River and is easily accessible to users. Sean Visinstainer, the owner of a local fly-fishing shop, has described the River as a unique urban fishing experience even though you do not feel like you are in an urban setting. "The river goes right through this major city, yet it has beautiful scenery and beautiful wild trout. It's awesome" (Bartlett 2018, p. 50).

Fishing is especially popular with people who live on the River, with about half of them engaging in either boat or shore fishing (REC Resources and Pinnacle 2010). In a 2010 survey by Pinnacle Research, shoreline residents cited litter and algal blooms as concerns or problems affecting their use of the River (REC Resources and Pinnacle 2010). No one mentioned PCBs. Given their extensive use of the River, and living on or near the River, residents would be expected to be most aware of any potential problems with PCBs affecting their uses, or their property values. In addition, the

Robinson survey shows very few people mentioned PCBs as part of cleanup efforts (Robinson Research 2015).

Such reactions to the presence of PCBs are not surprising. The economics literature shows that fish consumption advisories, including those based on PCBs, have a very limited impact, if at all, on people's decision to go fishing. Such decisions are more likely to be affected by factors other than the presence of advisories (MacNair and Desvousges 2007; Desvousges, MacNair and Smith 2000). Moreover, anglers can catch popular fish that do not have advisories at sites with some species containing advisories. In fact, only one species (carp) has an advisory based solely on PCBs and it is not a desirable game fish. Finally, the City's expert, Dr. J. Michael Trapp, provided no evidence of any reduction in recreational benefits of the River because of PCBs.

Opinion 3: The economy of Spokane has not been affected by PCBs.

The River is an important engine to the City and its residents and has not been affected by PCBs. The River supports a major hydropower network owned by Avista Utilities—with the original facility located in downtown Spokane. Relatively inexpensive electricity attracted numerous industries, including the aluminum industry. The River also serves as a key part of the transportation network for Western Idaho and Eastern Washington, helping to bring lumber, minerals, and various agricultural products to users throughout the world. The River plays a key role in economic development plans for the City and the region as a whole. Fishing-related activities generate substantial economic value to the Spokane area. For example, the number of jobs created both directly and indirectly by resident and nonresident angler expenditures total between 924 and 2,217, creating a total income of $29 to $69 million annually (TCW 2008).

Finally, the City and businesses continue to invest money in the waterfront area for recreation, tourism, business and residences. For example, the City purchased a 31-acre parcel with 4,500 feet of frontage on the River from the Sisters of the Holy Names using funding from the Spokane County Conservation Futures Program to help improve access to the River for citizens with disabilities. The City also has been an active participant in the redevelopment of University City, which includes a bridge across the River to link the life sciences and health services to an underdeveloped portion of the

City.[3] These investments in areas near the River enable the City to grow and prosper as it expands into education, health, and other growing industries and fields. The River also serves as a major attraction to recruiting and retaining both businesses and their workers in the Spokane area. The net result of all these investments is that Spokane finds itself as a very desirable place to live, especially among people who value the outdoors. All of the improvements and investments mentioned herein came long after the discovery of PCBs in the River. Thus, the River is an integral part of the Spokane area and its use has not been affected by the presence of PCBs.

Opinion 4: Conventional water quality pollutants limit recreation in the Spokane River.

Water quality in the River has improved dramatically over the last century; however, it is the discharge of untreated waste into the River over time, not PCBs, that has been the primary source of pollution historically limiting the recreational uses of the River. For nearly a century, the City discharged untreated sewage into the River. The development of wastewater treatment facilities in the early 1970s did not solve the problem. Raw sewage has continued to spill into the River as the result of combined sewage overflows (CSO). Currently, the City is permitted to discharge a measured quantity of untreated waste into the River.[4] Overflows continue to occur frequently as the combined wastewater system becomes overloaded during rainstorms. At times sewage has created unhealthy conditions in the River, which decreases the beneficial uses of the River.

In addition, the release of nutrients into the River from point and nonpoint pollution sources has resulted in excess plant growth and toxic algae blooms in Lake Spokane and Nine Mile Reservoir. These outbreaks affect the use of the waterway for boating and swimming because they make conditions unsafe for water contact recreation. PCBs do not contribute to plant growth or algae blooms.

The Washington State Department of Ecology maintains data on water quality in the River using a water quality index (WQI). This WQI tracks levels of a number of water

[3] https://static.spokanecity.org/documents/projects/south-bridge-landing-area/university-district-gateway-bridge-brochure-2014.pdf
[4] Hendron 2019, 51: 11-17.

quality indicators including: dissolved oxygen, temperature, fecal coliform bacteria, pH, suspended solids, turbidity, nitrogen, and phosphorus. PCBs are not included in this index of water quality used to assess the health of the River. The index shows an improvement over time as the City has begun to implement controls and treatment for its wastes. Some of the factors in the WQI produce changes in water quality that the public can perceive. Fecal coliform may result in warning signs and closures on the River. Nitrogen and phosphorus may result in algae blooms and excess plant growth, which are unsightly and interfere with the use of the River, and at times will result in warnings limiting or prohibiting use. PCB levels do not reduce the beneficial uses of the River. Regulators and City officials regularly inform the public that the River is safe for recreation.

Summary

The remainder of this report summarizes the bases for the opinions that I have reached in this case. PCBs have not reduced the enjoyment and beneficial use of the River for recreation or the ability of the City to prosper economically. I have reached these opinions to a reasonable degree of economic and scientific certainty. I have been compensated at $450 per hour for my work on this report and my testimony rate is $600 per hour.

2. BACKGROUND

Spokane, established in the 1870s, was originally formed around the falls and rivers by settlers. Even earlier, the Spokane Tribe, indigenous to this area, organized itself around the River because of the abundance of salmon. "During salmon runs, other tribes joined the Spokanes at the falls for fishing, trade, games, celebration, and socializing" (Arskey 2005)[5]. As the population of white settlers increased, however, conflicts rose between them and the Spokanes. In 1881, the Spokane Reservation was established northwest of the present City. The development of dams on the River in the early 20th century altered the salmon runs and the Tribe's ability to use the River as it did historically (Arskey 2005).

The River is unlike most Western rivers in that it is a river segment of only 111 miles in length. It begins in Lake Coeur d'Alene, Idaho, a 25-mile long natural lake that is formed by Post Falls Dam. The remainder of the River contains six more dams that block and shape the River as it flows West to intersect with the Columbia River Reservoir that is created by Grand Coulee Dam (Titone 2018).

The City's emphasis was mining, timber, and agriculture due to rich soil. In this regard, Spokane is not that different from many Western cities. It's smaller than Denver, bigger than Butte, and about the same size as Boise. All these cities' histories are intertwined with various extractive industries (Marshall 2018).

In 1889, a large fire devastated Spokane and surrounding cities. However, the town was rebuilt with new buildings that included "substantial and elegant brick, stone and terra cotta" (Downtown Spokane Heritage Walk). Local investors who made money in mining helped the City rebuild quickly after the fire:

> There was a flurry of construction and concentration of commercial buildings in the downtown core between the base of the South Hill and the Northern Pacific tracks that Railroad Avenue, where the tracks of the Northern Pacific were located, was elevated above street level in 1914-15 in an effort to eliminate traffic problems downtown (Downtown Spokane Heritage Walk).[6]

[5] Youngs (1996) provides additional insights in his Chapter 2 about the Spokane tribe and early Spokane history.
[6] http://www.historicspokane.org/HeritageTours/downtown/history.html

Shortly after, Spokane became a major railroad hub for numerous railroads in the area including the Northern and Union Pacific railroads. "Traffic throughout the lifetime of the road was mostly grain west, lumber east" (Spokane Portland & Seattle Railway Historical Society[7]). The railroad system also played a major role in moving materials to support war efforts.

At the time the railroads were gaining popularity, gold was discovered in the Coeur d'Alene mining district, and Spokane was established as "the service center for the north Idaho mines," (Downtown Spokane Heritage Walk) and the railroads were used to transport material to the mining towns. Spokane was shown as the center of all of this activity on maps. Spokane became "the main gate to the Pacific Northwest and establishing the Inland Empire which stretched from southern British Columbia to Oregon's Blue Mountains, from the Cascades to the Rockies" (Downtown Spokane Heritage Walk; Meinig 2005). The mines provided the wealth in this region for decades. During this time, Gonzaga University and Sacred Heart Hospital were also founded. The railroads and the discovery of various metals including gold, silver, lead, and zinc helped boost Spokane's economy. Farming in Western Washington also contributed to Spokane's growing prosperity. Timber has been an important resource to the area since the early settlers due to the large forests and proximity to the River for electricity to run the mills.

Washington Water Power, now Avista, began providing hydropower in 1889, around the time Spokane was destroyed in the fire. After the fire, Washington Water Power restored electricity to the City. Its first hydroelectric generating facility was built in 1890 and has been providing hydropower ever since (Spokane Historical). WWII played a major role in transforming the local economy with the development of aluminum production at Kaiser to support the war effort facilitated by the availability of inexpensive hydropower from the dams built along the River and the growth of Avista power (Arskey 2005).

The population trends in Spokane are consistent with the increase in the expansion of economic activity. In 1880, the population in Spokane was 300 people. In 1909, the population had grown to more than 100,000 people (Stratton 2005). It was

[7] See also Meinig 2005.

advertised as a great place to live due to the education, fine hotels, and commerce. Over the course of the twentieth century, Spokane experienced a slow and steady growth in population. However, more recently Spokane's rate of growth has increased. In 2017, Spokane County was one of the five counties in Washington that experienced the largest concentration of growth. "Population growth continues to be concentrated in large metropolitan counties. Seventy-seven percent of the growth occurred in the State's five largest counties: King, Pierce, Snohomish, Spokane, and Clark, respectively" (Office of Financial Management 2019).

The City has in the past and continues to value the River as the focus of recreation and economic activity for the City. As early as 1908, the famous landscape architect John C. Olmsted visited Spokane and identified the River as a prime park site. Real estate developers were encouraged to donate land to the City for parks, but the land was too valuable to industry (Klingle). It was not until the Spokane business and downtown property owners founded Spokane Unlimited in 1959, a group committed to reviving the City's retail core using the River as the engine for urban renewal, that the River began to transform into a recreational and cultural destination rather than just a resource for industry and transportation (Klingle). The River was an integral part of this renewal effort.

The group spearheaded the bid for the World Expo '74 themed "Man and the Environment" and developed Havermale Island from a railroad switchyard to create the centerpiece for the fair (Klingle). The fair succeeded in bringing the River back into the heart of the City. Riverfront Park opened in 1976 attracting large numbers of visitors and revitalizing downtown Spokane.

Unfortunately, the energy from the World Expo did not last. Spokane experienced lackluster government, high unemployment, and stagnant real estate market problems in the 1980s (MIG Inc. 2008). Major downtown department stores could not compete with suburban growth. Furthermore, Kaiser Aluminum changed ownership in the 1990s, reducing employment opportunities in the City (Arskey 2005). The Spokane area suffered from job and tax losses during the Kaiser bankruptcy proceedings. "Kaiser once employed 2,000 workers in the area, but that fell to fewer than 600 after the February 2002 bankruptcy filing" (Geranios 2006). Nevertheless, Spokane again turned to the River as a focal point for restoring the economic energy and activity in Downtown Spokane. The City along with key businesses and civic groups have repeatedly

spearheaded investments in facilities on or near the River. Parks and Recreation spending is a priority in both the City and the County. Expenditures per capita have increased 13 percent in real numbers since 2005 (43 percent to 74 percent in nominal) (Spokane Trends (a)). Clearly, the discovery of PCBs in the early 1980s in the River has not deterred the City from investing money in its riverfront parks.

In summary, the River has provided the City of Spokane and Eastern Washington with substantial economic, recreational and social value. Spokane, which was incorporated more than 125 years ago, is the second largest city in Washington. Because of its proximity to the River, it flourished during the mining and railroad boom. Those economic activities, along with timber, hydropower, and aluminum production, are what supported Spokane's growth. Spokane, like many cities, experienced ups and downs in the economy as habits, lifestyles, and income changes. However, more recently, it is experiencing revitalization from enhancing parks and recreation, improving housing downtown, and adding entertainment attractions along the River. Thus, the City of Spokane has continued to invest heavily to improve access to the River and to enhance the value of properties near the River, continuing to underscore the importance of the River in the future of the City. Clearly, such investments are inconsistent with alleged concerns about PCBs affecting the beneficial uses of the River.

3. OPINIONS

Opinion 1: The City is not a Trustee for the Spokane River, or the resources within it or the uses it supports.

The City's nuisance claim of a reduction in the natural resource services of the River resulting from PCBs is comparable to a claim for natural resource damages. In claims for injuries to natural resources and human uses, there are well-established approaches for measuring potential damages. Specifically, with the enactment of CERCLA and the promulgation of regulations in 43 CFR Part 11, the procedures for evaluating injuries and losses to natural resources are well documented. A NRDA requires the participation of all relevant natural resource Trustees. Because the City is not a Trustee of the fish in the River, or any other relevant resources, it should have included the Trustees of those resources, which are the U. S. Fish and Wildlife Service, the Washington Department of Ecology and the National Oceanic and Atmospheric Administration (NOAA), and potentially tribal Trustees. Marlene Feist, the City's witness confirms that the City is not a Trustee for either the River or the fish in it:

> Q: The City isn't a trustee of the natural resources in the river; correct?
>
> A: Trustee of the natural resources. I don't think so.
>
> (Feist 894:25-895:2-4)

> Q: You're aware that the city doesn't own the fish that are in the river, correct?
>
> A: Yes. We don't own them.
>
> Q: You are aware that the fish and the river are actually owned by the state of Washington?
>
> A: Okay. Sure.
>
> Q: Okay. No reason to disagree?
>
> A: I have no reason to disagree.
>
> (Feist 653:23-25-654:2-7)

Any assessment of potential natural resource damages must include a careful consideration of the services that the River provides. Services are the most fundamental concept in natural resource economics, and as such, play a critical role in damage assessments (Kopp and Smith 1993; National Research Council 1997). People value natural resources because of the flow of services they provide. This is akin to the fact that people value financial assets based on the money flows those assets yield over time. As I have shown above, the River supports a wide range of human use services. Ecological services are the services that one resource provides to another. Habitat or food sources are two of the most prevalent forms of ecological services that benefit wildlife. Such services are thriving in the River. The City's experts provide no assessment of lost beneficial uses of the resources of the River. Nor do their efforts provide any credible economic evidence to support any opinions on potential damages. Such evidence would have included determining first whether any loss in services had occurred, and only if so, determining how much restoration would be needed to equate the flow of services from potential restoration projects to the cumulative amount of services that were lost.

Thus, the evaluation of restoration alternatives is based on both economic principles and regulatory guidance for damage assessment. The principles enable restoration actions to be evaluated using standard economic concepts. 43 CFR Part 11.82 provides a list of seven factors that Trustees should consider in evaluating restoration projects, including technical feasibility and cost effectiveness. Clearly, none of the City's experts has conducted any such analysis.

Opinion 2: The overwhelming evidence demonstrates that PCBs have not affected the recreational use of the Spokane River.

"The Spokane River is arguably Spokane's finest natural resource and is tied to a rich history of culture and recreation" (Spokane Trends (b)). The River provides a center for recreation in the City and "is one of the City's most valuable natural and economic resources" (The Lands Council). In fact, recreational use of the River has increased over time. Moreover, the City is providing more and better access to the River (Robinson Research 2015; City of Spokane 2018) to further encourage recreation uses by its residents. The City continues to increase and improve public access to the River

(Feist 2019, 218:13-25). There has not been a single instance where the City has acted to prevent public use of the River because of PCBs (Feist 2019, 218:13-25).

In particular, the City is making a $60 million investment in Riverfront Park (Figures 1 and 2). In 2012, Visit Spokane hired Randall Travel Marketing to develop a comprehensive travel research study for Spokane. The study included a survey of 20 lodging properties for a total of 3,772 rooms. Among the visitors surveyed, Riverfront Park was ranked the number one tourist attraction in the region (Riverfront Park Master Plan 2014, p. 20).

Figure 1: Redevelopment Plan for Riverfront Park
(Deshais 2014)

Figure 2: Riverfront Park Revitalization
(https://my.spokanecity.org/riverfrontspokane/about-us/history/)

Recently, Avista Corporation has developed a new park on the riverfront, Huntington Park. Located in Downtown Spokane, Huntington Park is a popular destination for tourists and locals. The park saw 18,827 individual visitors during the peak use season of 2014 (Pinnacle Research and Consulting 2016, p. 3). According to Visit Spokane, Huntington Park is one of the "most fantastic experiences in the Northwest" (Visit Spokane). The park was developed by Avista Utilities, was dedicated in 2014, and is located between the City Hall Plaza and the brick Washington Water Power building. The park features a 360-degree overlook walkway, dozens of interpretive signs and many public art installations, including Native American culture and hydroelectric history. The lower section of the park brings you right up to the falls (Figure 3).

Figure 3: Huntington Park
(https://www.inlander.com/spokane/huntington-park/Location?oid=4355077)

The City has also invested heavily in the University District, which is another area located near the River. The City is an integral partner in this large redevelopment effort to raise the economic standard of living in a neglected portion of the City. The University District Gateway Bridge is an important part of this effort. This pedestrian bridge connects over the BNSF Railroad to link together business and residential development between the universities and the medical community on Spokane's lower South Hill.[8] The bridge was completed in the late fall 2018. It features an arch that provides another focal point for downtown Spokane and accentuates the value of property in downtown near the River (Block 2018). However, the connectivity of the bridge for cyclists is limited due to competing uses with motorists. Further connections to existing trails will be needed to fully realize the potential of the new bridge (Deshais 2018).

Local universities emphasize the River as a benefit to attending their schools. Gonzaga University promotes the River on their website when discussing things to do around Gonzaga. Specifically, Gonzaga says: "Our city parks are also popular destinations. Riverfront Park, just minutes from Gonzaga's campus, features a carousel, sky ride over the Spokane Falls, fun family activities and easy access to the Centennial Trail along the Spokane River" (Gonzaga University). Additionally, Washington State

[8] https://static.spokanecity.org/documents/projects/south-bridge-landing-area/university-district-gateway-bridge-brochure-2014.pdf

University (WSU) - Spokane Campus lists "downtown along the river" as a reason why students should choose WSU-Spokane. "Located in the heart of Spokane's University District, the WSU campus is bordered on one side by the Spokane River and Centennial Trail, giving students direct access from campus to recreational activities" (Washington State University).

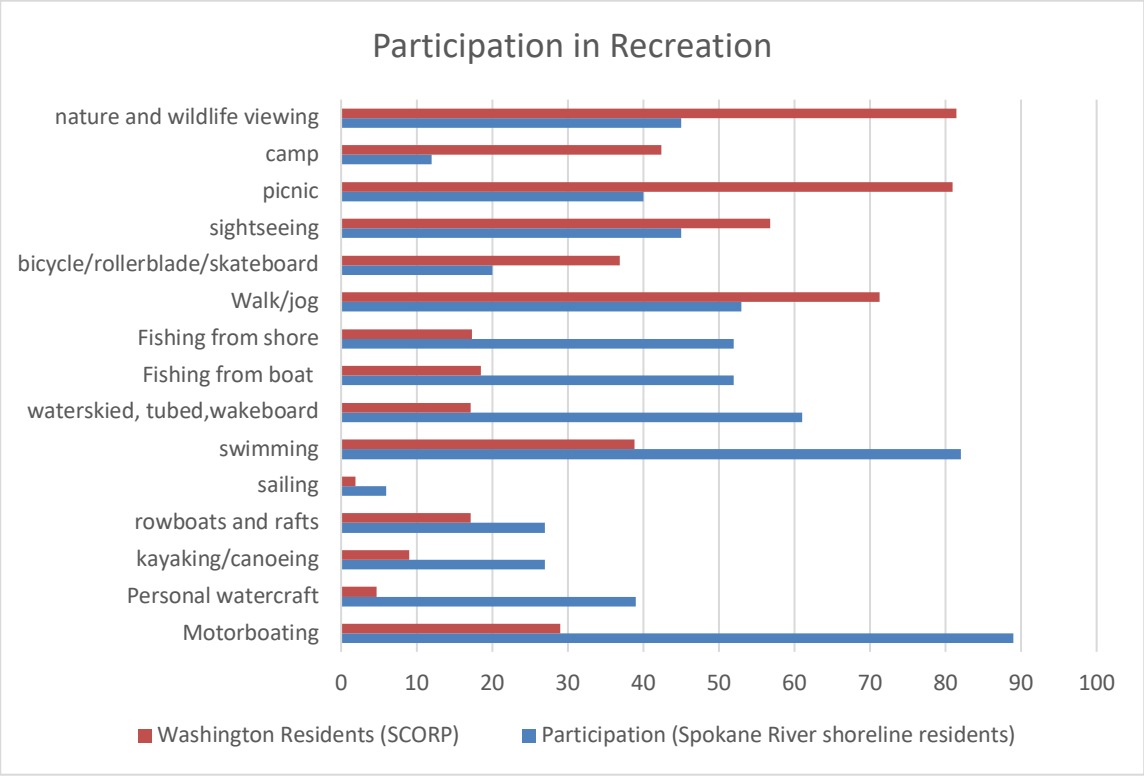
In fact, "state funding has poured into Spokane-area recreation projects" (Francovich 2018a). The South Gorge Trail received $1,052,000 from three different state funding sources. City councilwoman Candace Mumm states, "in my opinion, to receive funding from three programs confirms how much support exists to improve the public's access and enjoyment of the Spokane River" (Francovich 2018a). The City also purchased a 31-acre parcel with 4,500 feet of frontage on the River from the Sisters of the Holy Names using funding from the Spokane County Conservation Futures Program. The land will be developed to be accessible to disabled anglers and add to the Centennial Trail (Francovich 2018b; Culver 2017). Clearly, PCBs have not affected development and use of the riverfront as a recreation destination. A master plan for careful development of recreational amenities in the Spokane River Gorge has been developed to provide a vision for future projects that will link trails, parks, and access to the River within minutes of the downtown core (CEDS 2015, p. 22). The City and County also continue to expand the bike trail system, the jewel being the Centennial Trail, which runs for nearly 40 miles along the River providing recreational access to the River and its parks. The City even used the new combined sewer overflow project in downtown to increase access to the River by creating a park overlooking the River (Figure 4).

Figure 4: Spokane Downtown Combined Sewer Overflow Project
(https://www.kxly.com/news/photos-a-look-at-the-new-downtown-spokane-plaza/1135831400)

Moreover, the 2010 survey by REC and Pinnacle Research (conducted for Avista) of people who live on the River find a high level of recreation use including both near water and in water recreation activities. As shown in Figure 5, 85 percent of residents living on or near the River engaged in some form of motorboating during the previous year. In addition, kayaking and canoeing also were popular among these residents with 53 percent of them using this form of water craft. Residents near the shoreline of the River also engaged in high levels of fishing with 53 percent of them fishing from boats and another 52 percent from shore. Swimming also was a very popular activity with more than 80 percent of shoreline residents engaging in swimming in the previous year. Walking, hiking and jogging were the most popular near water activities with 53 percent of shoreline residents taking part in these activities. Picnicking and sightseeing also were popular among shoreline residents. In comparison to the participation rates of Washington state residents, Spokane River residents had a much higher participation rate in water-based activities and lower rates of participation of nonwater-based activities. These results indicate that, as expected, shoreline residents favor water-

activities over other types of outdoor activities as would be expected indicating that the River is an important source of recreation for these residents.

Figure 5: Comparison of Activity Participation for Shoreline Households During the Last 12 Months and Washington State Residents (from Figure 5-1, REC Resources Pinnacle Research 2010, p. 5-5 and Responsive Management 2012, pp. 7-14)

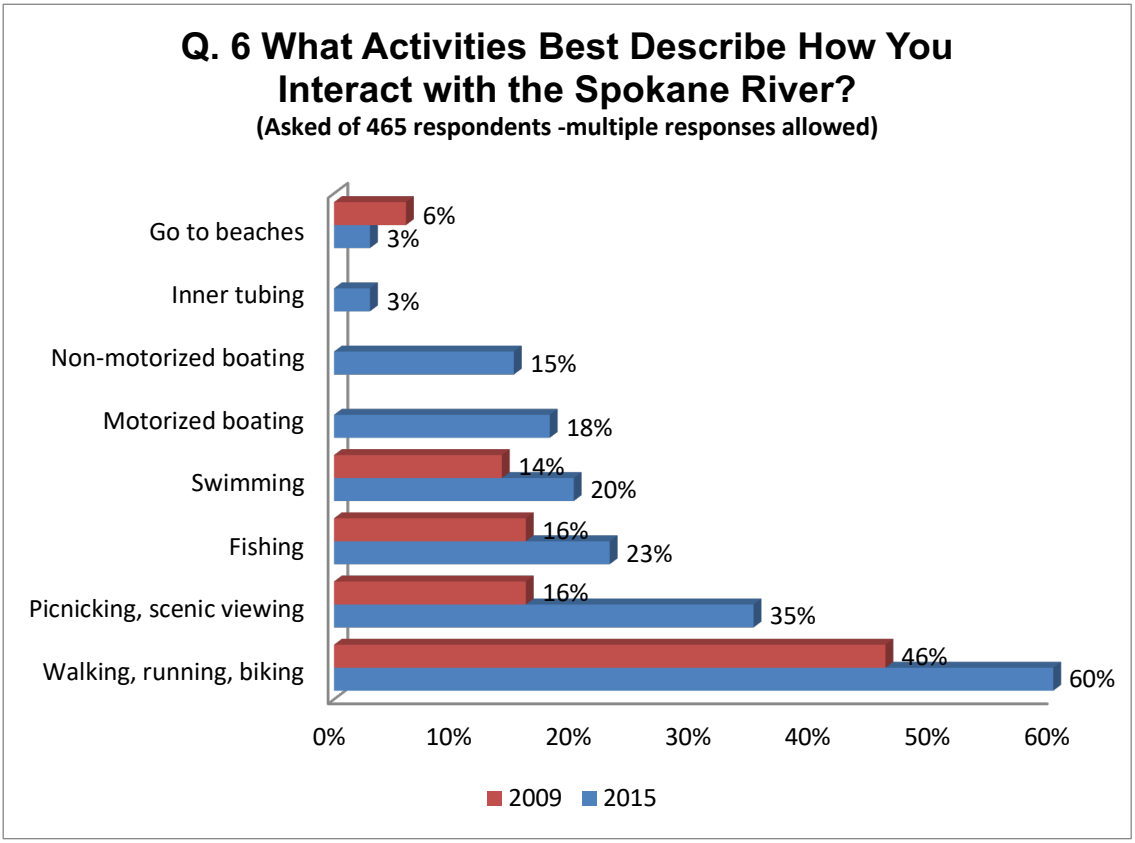


The survey of shoreline residents included questions about the facilities that were available for use. Shoreline residents expressed reasonably high levels of satisfaction with their recreation facilities in 2009 with 51 percent of them either satisfied or very satisfied with the facilities (REC Resources Pinnacle Research 2010, p. 5-6). The survey did provide residents the opportunity to respond about any other concerns involving the River. None of the residents mentioned PCBs in the River as a concern.

The 2015 telephone survey of residents living in Spokane, Lincoln and Stevens Counties in zip codes adjacent to the River provides insight about people who use the

River but do not actually live on it (Robinson Research 2015).[9] Figure 6 highlights the popular recreation activities as indicated in this survey. Clearly, walking, hiking or biking are the most popular recreation activities that occur along the River, particularly along the urban area. The survey shows that 60 percent of those interviewed participate in these activities along the River. Other near water recreational uses, such as picnicking and sightseeing also are very popular, with 35 percent of the survey participants taking part in these activities along the River (Robinson Research 2015). This is an increase from 14 to 19 percentage points between 2009 and 2015.

Figure 6: Results for Question 6 from Robinson Research 2015



The River and Lake Spokane offer many locations for swimming. There are nine swimming sites between the Stateline and Nine Mile Falls and an additional eight sites on Lake Spokane (Long Lake) (Spokane River Forum (a)). Rafting and kayaking as well as motorized boating are also popular on various stretches of the River with 15% and

[9] Some caution is needed with the Robinson results because of the lack of survey weights and potential unrepresentativeness of the results.

18% participation respectively (Robinson Research 2015). One local canoeing/kayaking enthusiast wrote:

> The Spokane River is the perfect canoeing classroom. It's handy—practically in the backyards of half a million people. And its waters range from Class I (easy-peasy, obstacle free) to Class III (big waves, advanced skills and nerves required) (Titone 2018).

The Upper Spokane, the twenty miles between the Idaho border and the Spokane City limits, provides a unique experience for white water enthusiasts. Class III rapids provide many challenges with the best rapids between Barker and Sullivan roads that yield a long wave train (Titone 2018). The next section of the River between the Upper and Lower is not accessible for boating. However, it can be seen and enjoyed from many urban vistas including the Opera House, a tourist gondola, various parks, or the Centennial Trail.

The Lower Spokane, which begins at Peaceful Valley, contains a variety of boating options depending on the part of the River. In this region is the Riverside State Park, which includes Bowl and Pitcher, Devil's Toenail, Plese Flats and Deep Creek Landing (Figures 7 and 8). This area boasts popular Class II to Class IV rapids for rafters and experienced white-water kayakers. Riverside Park occupies 12,000 acres and nearly 200,000 feet of shoreline along the Spokane and Little Spokane Rivers just north of Spokane. Amenities include 55 miles of hiking and biking trails, 25 miles of horse trails, 120 feet of dock, three boat ramps, amphitheater, museum, rock climbing, fishing and many additional water-based activities as well as winter sports (Washington State Parks). Most recently, a new launch for rafters was added in Peaceful Valley's Redband Park. This launch provides easy access to the Great Gorge. "It's a premier addition to the Spokane River Water Trail," said Spokane River Forum Executive Director Andy Dunau (Spokane River Forum (b)). The launch was four plus years in development led by the Spokane River Forum through funding support from the City, Washington Department of Commerce, Spokane Conservation District, the Spokane Tribe of Indians, TransCanada, and Spokane Indians Baseball (Spokane River Forum (b)).

Near Downtown, new access was created on the south side of the River, under the Division Street Bridge and near the Spokane Convention Center. "The new access provides the community unique entry into the vibrant Spokane River in the downtown core and supports the City and the community's vision for a clean and accessible river"

(Cotton 2015). Mayor Condon states, "It is exciting to give people another way to access and celebrate the Spokane River. The City is committed to embracing and protecting our greatest natural resource" (Cotton 2015). M. Feist testified that the City promotes the use of the River for recreation. When asked about this, Feist responded, "Absolutely" (Feist 2019, 69:2). She also agreed that PCBs do not limit various recreational uses (Feist 2019, 66-74).

Figure 7: Bowl and Pitcher, Riverside Park (Jones 2014)

Figure 8: Riverside State Park
(https://parks.state.wa.us/DocumentCenter/View/1935/Riverside-State-Park---overview-PDF)

The River has been a popular recreation area for many years and there is no indication that PCBs have reduced its popularity. In 2003, a survey of recreation sites, conducted for Avista dam relicensing, estimated annual recreational use of the River at designated recreation sites at 119,321 users recreating 722,269 days at the Upper Falls/Monroe Street/Nine Mile Reservoir Sites (Avista Corporation 2005, p. 5-227; Berger 2004, p. C-2.4).[10] Subsequent surveys do not calculate the overall seasonal usage; however, vehicle counts in 2009 indicate substantial usage levels. For example, there were 17,540 vehicles counted at the Nine-mile recreation area in 2009 and 16,766 vehicles at the Long Lake Campground (REC Resources and Pinnacle Research 2010). In addition, the Robinson survey indicates that residents increased their average usage of the River from 28.4 in 2009 to 33.4 days per year in 2015 (Robinson Research 2015). Finally, the 100-acre Riverfront Park in the heart of Spokane attracts 2.2 million visitors a year (Riverfront Park Master Plan 2014). "There's so much to do on this amazing river, and it doesn't get used to its potential," says Travis Nichols, veteran Spokane River kayaker on his website, Outdoors OutThere.

The City and Avista Corporation have demonstrated the public's preference for recreation on the River by developing numerous parks and access areas along the shoreline. There are 68 recreation sites along the River from the Idaho border downstream to Spokane (Long) Lake Dam. Four of these sites provide boat launching facilities, 7 have swimming areas, 50 have on-site trails or trailheads, 18 provide picnic facilities, and 4 provide overnight camping (REC Resources and Pinnacle Research 2010, p. 2-10). In addition to the motor boat launch sites, there are numerous sites (31) to put in non-motorized boats such as kayaks, canoes, rafts and stand-up paddleboards (Spokane River Forum (a)). Likewise, swimming occurs at 19 identified sites along the River (Spokane River Forum (a)). There are 26 sites where you can access the River for shoreline fishing (Spokane River Forum (a)). In fact, developing public trails and additional access to the River is part of the two-year action plan developed by the City as part of their six-year strategic plan for the City (Joint Administrative Council 2017). The 2018-2019 Community Investment Plan for the City has allocated $7.1 million in trail/river investments to create more connection with the River (City of Spokane 2018). Similarly, in the City of Spokane Valley, a survey of public attitude, recreation interests,

[10] The numbers do not include Riverside Park because the study was not able to make dependable vehicle or users' counts at these busy downtown sites. Avista consultant Louis Berger estimates that including this site could nearly double the number of visitors.

and recreation participation in 2004-2005, indicated that residents felt acquiring additional land along the Spokane River was "very important" (MIG Inc. 2006, p. 5-1). The City has never been told by anyone that these recreational activities that the City has been promoting could present an unreasonable health risk as a result of PCBs (Feist 2019, 151:24-152:4).[11] In fact, the City has never warned the public that engaging in recreation and tourist activities in and around the River could be harmful to one's health because of PCBs (Feist 152:5-12). The City is not aware of any instance when a person's use of the River was impaired by PCBs because of contact with the River (Feist 2019, 177:14-18).

The River has had a long and varied history as a fishery and has always been a significant site for recreational fishing. PCBs have not reduced this popularity. The River was once known as the River of Kings (Kershner 1995). It was one of the most productive salmon streams in the entire Columbia system with summer Chinooks (King Salmon) reaching 50 to 80 pounds (Kershner 1995). The Spokane was a famous summer fishing camp for the Spokane Tribe and many others. It is estimated that over a million salmon ran up the River annually. Spokane's early hotels did a thriving business among Eastern fishermen. The salmon were Spokane's first major tourist attraction (Kershner 1995). The days of the King Salmon ended in 1915 when Long Lake Dam blocked the upper three-quarters of the Spokane in 1915 and the remainder was cut off by the Grand Coulee Dam, which blocked the Columbia in 1939. Neither dam was constructed with fish ladders to facilitate salmon migration. However, above the falls, a huge population of cutthroat trout thrived on an abundance of insects resulting from the influence of the Spokane aquifer, which keeps the River cool in the summer and unfrozen in the winter. The free-flowing sections from Riverfront Park to Post Falls "still contain good populations of trout, feeding on prolific insects" (Kershner 1995).

Fishing is a popular activity on the River today, particularly in Lake Spokane. There are many places to access the River for shoreline fishing and some reaches are heavily stocked with catchable sized trout. One would expect that if fish consumption were a concern, the State of Washington would not be stocking fish in the River and the

[11] Marlene Feist has worked for the City for 21 years, first in the Communications Department and then in the public works and utility division as the director of strategic development in public works, which involves managing information with the public, regulators, media, other departments and other governments.

City would discourage the State and warn its citizens.[12] There are five hydroelectric dams on the River that create river reaches with various characteristics and consequently differences in the fisheries (Table 1). Twenty-five percent of local residents who participated in a 2015 survey reported fishing on the River (Robinson Research 2015) (Figure 9).[13] The number of residents reporting fishing on the River and Lake Spokane has increased from 19% in 2005 to 25% in 2015 (Robinson Research 2015). Joe Roope of Castaway Fly Fishing Shop states, "The Spokane River is an excellent fishery. Make no mistake about it. And the fact it exists in the middle of a lively city is nothing short of amazing" (Maeder)[14].

Table 1: Spokane River Reach Fisheries (FERC 2007)

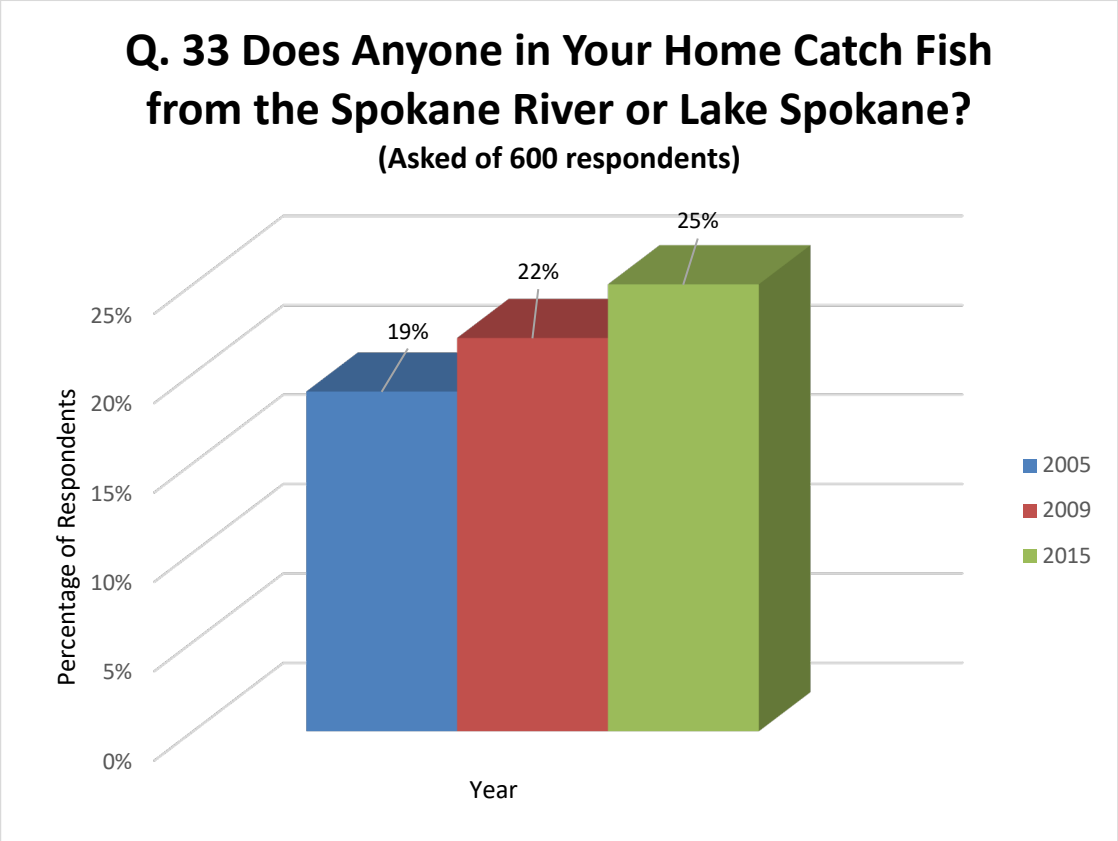
Spokane River Reach	Description	Fishery
Post Falls Dam to Upriver Dam	15 miles Species include: rainbow trout, longnose sucker, longnose dace, yellow perch, pumpkin seed, and bullhead catfish species Includes six recreation areas where shoreline fishing occurs: Harvard Road Park, Barker Road, Mission Avenue, Sullivan Park, Mirabeau Park, Plante's Ferry Park and Boulder Beach Park.	The Idaho Department of Fish and Game and Washington Department for Fish and Wildlife manage this section of river as a wild trout fishery with no supplemental stocking. They have identified "the self-sustaining rainbow trout population for this reach as a priority for protection." Fishing is catch and release only and is known as a destination trout fishery. "The stretch of river east of Spokane, which offers some beautiful trout water is where I would recommend going if you really want to sample what this pretty river has to offer." (https://liprippersfishing.wordpress.com/2013/02/22/spokane-river/)

[12] It has been found that trout stocked in the River contain PCBs from the fish feed used (Wong 2018).
[13]The Robinson results are informative but not definitive because of the lack of survey weights which limits the ability to draw definitive conclusions.
[14] Maeder, Steve. https://northwest-fly-fishing.myshopify.com/blogs/features/15714004-spokane-river-wa

Spokane River Reach	Description	Fishery
Upper Falls to Spokane Falls and Monroe Street Dams	Located in downtown Spokane at the natural Spokane Falls. Below the Monroe Street Dam, the River is free flowing and extends 10 miles before reaching Nine Mile Reservoir. There is one designated recreation area used for shoreline fishing at McKinstry at Gonzaga.	The Upper Falls Reservoir is managed as a put-and-take hatchery rainbow trout fishery since 1995. "The catchable-size trout released into the river provide a popular recreational fishery within the City and downstream reach of the River. Continuing the stocking of sterile rainbow trout in the Upper Falls Reservoir and the Nine Mile Reservoir is an overall management objective of WDFW for fisheries in the Spokane River." This reach is a popular shore-fishing location because of the easy access to the shoreline and is also popular for fly fishing particularly in the area below the Upriver Dam and Greene Street (Spokane River Forum (a)).
Nine Mile Dam	Fish population similar to the upper Spokane River. There are four parks where shoreline fishing occurs: Aubrey Whit Parkway, Plese Flats, Nine Mile Dam Non-Motorized Take-out, and Riverside Park Boat Launch.	In the reach between Plese Flats Park and Ninemile Dam 8,000-9,000 hatchery trout are stocked annually (Spokane River Forum (a)). The area is popular for fly fishing and many angler use the area around the Water Reclamation Facility (Spokane River Forum (a)).
Lake Spokane (Long Lake)	23.5 miles long covering 5,060 acres.	Long Lake Reservoir has a "substantial and diverse fish population." The overall management objective of WDFW for fisheries in Lake Spokane include enhancing angling opportunities by stocking rainbow trout and maintaining the current warm water fishery. WDFW currently manages Lake Spokane as a mixed-species fishery and has stocked the lake with rainbow trout, brown trout, and eastern brook trout. In 2014, WDFW and Avista Utilities made a 10-year trout stocking agreement, which

Spokane River Reach	Description	Fishery
		involves stocking 155,000 catchable-size rainbow trout each season (Landers 2014). The shallow-areas of the lake experience dense aquatic and emergent plant growth, which inhibits recreation but is good habitat for bass, perch and crappie supporting a popular fishery (Avista Corporation 2005).

Figure 9: Fishing Participation by Area Residents
(Robinson Research 2015, p. 26)



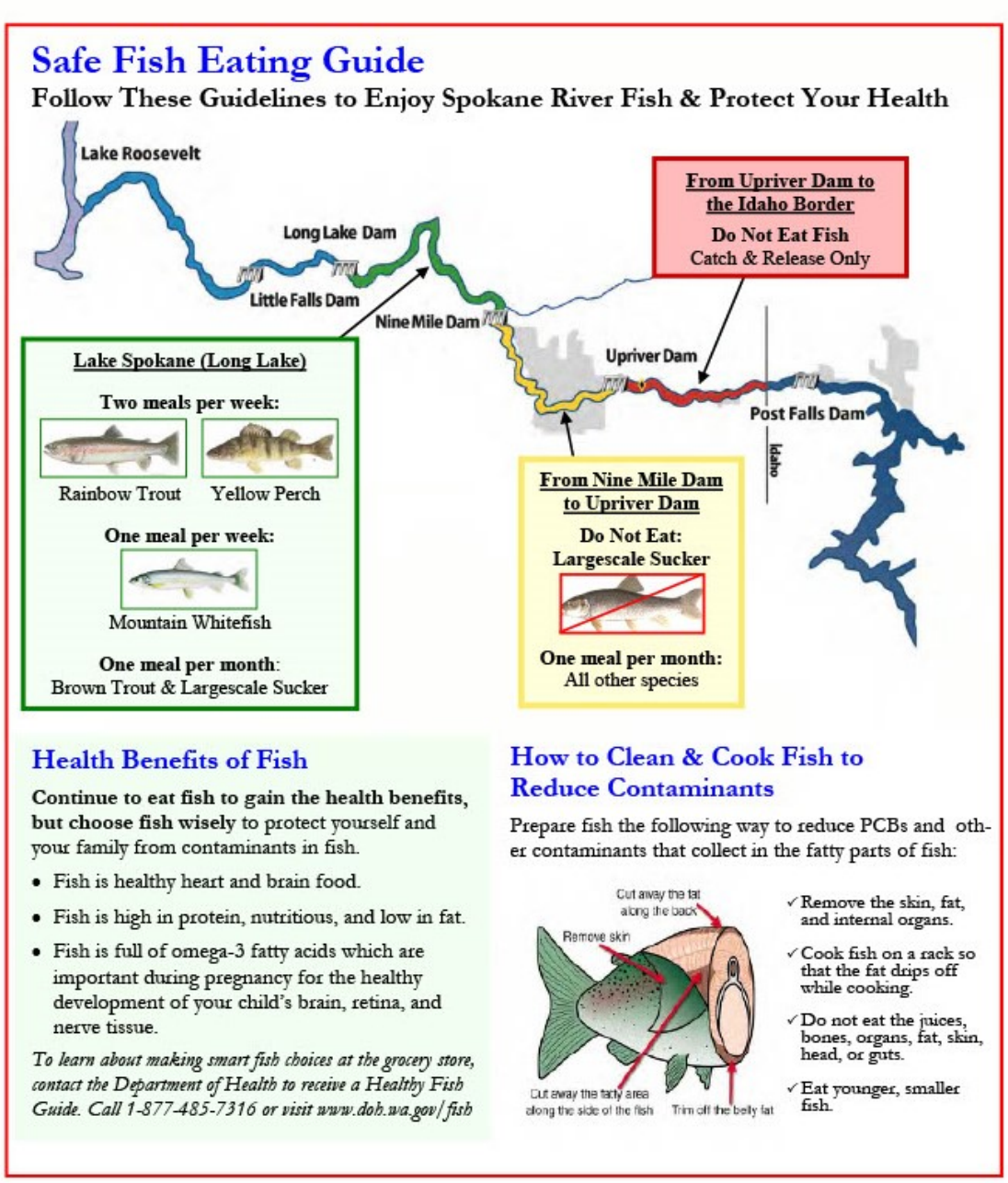
There are fish consumption advisories for PCBs, Mercury and other contaminants in place on the River and Lake Spokane (Washington State Department of Health 2007). The first fish consumption advisory on the River was issued in 1999 due to lead (Washington State Department of Health 2007). The 1999 fish consumption advisory

was updated in March 2001 because of PCB concentrations in fish.[15] In 2005, DOH analyzed fish samples for PBDEs (flame retardants) and found high levels. They determined that the PCB meal limits would also be protective for PBDEs (Washington State Department of Health 2007). The fish species under advisory all contain multiple contaminants; all but carp which is not a recreational sport species and is currently under an eradication program in Lake Spokane (Figure 10)(Avista Corporation 2017).[16][17]

Figure 10: Carp Eradication Program (https://www.spokesman.com/stories/2017/may/19/removing-carp-from-lake-spokane-mixes-science-grun/

[15] Ecology conducted its first survey for PCBs in fish tissue and sediment in 1993 (Ecology 2011).
[16] https://www.doh.wa.gov/DataandStatisticalReports/HealthDataVisualization/fishadvisory
[17] https://www.spokesman.com/stories/2017/may/19/removing-carp-from-lake-spokane-mixes-science-grun/

Figure 11: Fish Consumption Advisories
(Washington State Department of Health Pamphlet)



It has been shown that limited fish consumption advisories have little impact on fishing. MacNair and Desvousges (2007) show that mildly restrictive advisories have a much more limited impact on people's choices than restrictive ones. They also found that FCAs have a very limited, if any, effect on people's decision to participate in fishing (Desvousges, MacNair and Smith 2002). People's socioeconomic characteristics such

as income and work status were much more important factors in people deciding to fish. Similarly, Jakus et al. (1997) show that removing advisories on a reservoir increased the probability of visiting the reservoir to fish by only 0.1 to 2.55 percent. Likewise, Parsons, Jakus and Tomasi (1999) found that predicted total season fishing trips would increase by approximately two percent in the absence of restrictive advisories on inland lakes.

Although fish consumption advisories may decrease the recreational use of some fisheries, there is no evidence that fishing has decreased on the River as a result of consumption advisories. Even a consumption ban may have a negligible effect on fishing because people enjoy fishing for many reasons other than for the consumption of their catch. Moreover, in areas where catch-and-release fishing is popular, the absence of taking fish from the fishery increases the size and numbers of catchable fish resulting in an improved fishing experience. The most restrictive advisory resulting in catch and release regulations is in an area of the River with a protected natural trout population that is restricted from taking regardless of the advisory. In fact, this section of the River is very popular with trout anglers according to Spokaneriver.net.

> Special regulations, including wild fish release rules and restriction on the use of bait, have helped make the Spokane River a respectable trophy-trout fishery in recent years. The stretch of river east of Spokane, which offers some beautiful trout water, is where I would recommend going if you really want to sample what this pretty river has to offer.[18]

Similarly, Steve Moss, an avid fly fisherman on the Spokane River and lecturer on the subject, names three sites above the Upriver Dam as the best winter fly fishing spots for trout on the River (Landers 2010). The River is known as a great fly-fishing river that locals like to keep secret. “Spokane anglers relish living in the best fly-fishing town never mentioned in fly-fishing circles. A lot of serious fly casters live here with no intention of leaving a city with all the amenities-yet no crowds to detour convenient pursuit of fish” (Landers 2012).

Many anglers choose to practice catch and release fishing even when there are no limitations on consumption. A survey of anglers on the River conducted in 1998, before the first consumption advisories were published, showed that most anglers practice catch and release (Spokane Regional Health District 1998). The results of the survey showed that only 59.1% of the respondents kept any of the fish that they caught.

[18] https://liprippersfishing.wordpress.com/tag/where-to-fish-the-spokane-river-spokane-river-fishing-holes/

Of that 59.1%, 76.0% also practice catch and release. Approximately 25% of respondents reported fishing using catch and release exclusively. These results provide evidence that anglers receive most of the benefits of fishing from the activity itself and not from simply catching fish to consume.

Thus, the ability to substitute to alternative sites and species and the preference among many anglers for catch and release fishing limits any potential loss under FCAs. In particular, trout is a popular sport fish species, which is stocked in all but the downstream portion past Upriver Dam. Only the area between Upriver Dam and the Idaho border restricts the keeping of trout. This area is managed to protect the wild trout population. Downstream areas are stocked with hatchery trout for which there is no restriction on consumption, and other species have only limited restrictions on consumption with no restrictions in Lake Spokane. Anglers wishing to keep their catch can substitute downstream on the River or to Lake Spokane or Lake Roosevelt. The consumption advisories do not restrict the activity of fishing. The City agrees that the act of fishing is not impaired by PCBs (Feist 2019, 92:8-93:20). As a result, the overwhelming evidence is that PCBs in the River have not had an impact on the use of the River for fishing.

The City's expert witness Dr. J. Michael Trapp opines that PCBs cause impairments to beneficial uses in the River, however, Dr. Trapp provides no economic evidence than any loss in use has occurred. He merely states that the River is on the state of Washington's 303(d) list of impaired waterbodies for PCBs and that edible fish tissue does not meet the Washington State human health criteria (Trapp and Bowdan 2019, p. 14). Dr. Trapp's report provides no evidence of an actual loss in recreational or economic use resulting from PCBs. He shows no reduction in the quantity or quality of recreational use of the River. Dr. Trapp states in his first opinion that fish consumption advisories are the limiting factor for the amount of fish that can be consumed but provides no evidence that these advisories are actually limiting fish consumption or reducing fishing in any way. As I stated earlier, these advisories do not limit fishing itself and many anglers choose to catch and release. People may substitute to different species or substitute areas.

In summary, recreational use of the River continues to grow and improve. As shown above, much of the outdoor recreation in Spokane is centered around the River.

The City and private groups continue to invest money in the River corridor supporting recreation along the River and its shore and within the River itself. There is no indication that PCBs have affected the beneficial use of the River for recreation tourism, economic development, or the satisfaction of recreators.

Opinion 3: The economy of Spokane has not been affected by PCBs.

The River is a vital natural resource for the City and the surrounding region. "A river running through the heart of downtown Spokane and the region that brings power, beauty, and clean drinking water through its interconnection with our unique sole-source aquifer" is an asset that contributes to Spokane's community and economic future (CEDS 2017, p. 6). Spokane County was created in 1858, and by the 1870s, Spokane became the hub in the inland Northwest for mining, timber and railroad activities (Washington State Employment Security Department). The River provided hydropower, which provided the base for growth in manufacturing. Plentiful hydropower along with the railway systems and interstate highway systems created a solid manufacturing base in Spokane. These transportation corridors brought in commodities to Spokane where mills used power from the River to transform them into commodities like flour, lumber and ingots for sale across the country (Klingle). Low cost and clean electricity from hydropower continues to be an asset to the city in attracting business and industry. The presence of PCBs in the River has not affected the ability of the River to produce hydropower. In fact, according to the CEO of Inland Power and Light, a nonprofit cooperative power distribution company, Inland's rates are in the lowest one percent in the country and the lowest 15 percent in the Northwest (Tables 2 and 3).

Table 2: Spokane County Electricity Rates (Selected examples of monthly charges) (2019 Market Fact Book p. 27)

	Avista Corp., Spokane	Inland Power and Light Co., Spokane	Vera Water and Power, Spokane Valley
Residential customer: 1,000 kWh Usage	$88.54	$91.55	$79.45
Commercial customer: 12,500 kWh Usage 50kW demand	$1,455.00	$1,062.50	$4,060.00
Industrial customer: 200,000 kWh Usage 500 kW Demand	$18,713.00	$15,125.00	$15,460.00

Table 3: Comparison of Selected Electricity Rates (Investor-owned utility rates as of July 1, 2018) (2019 Market Fact Book, p. 27)

	Residential 1,000 kWh	Small Commercial 1,000 kWh 3kW demand	Med. Commercial 14,000 kWh 40 kW demand	Small Industrial 400,000 kWh 1,000 kW demand
Spokane Avista Corp.	$93	$196	$1,550	$35,545
Lewiston, Idaho Avista Corp.	$97	$163	$1,336	$30,206
Bellevue, Wash. Puget Sound Energy	$101	$152	$1,349	$31,950
Portland, Ore. Portland General Electric Co.	$121	$186	$1,336	$31,610
Boise, Idaho Idaho Power Co.	$102	$191	$1,031	$28,418
Missoula, Mont. Northwestern Energy	$115	$187	$1,469	$33,992
Salt Lake City PacifiCorp	$110	$186	$1,336	$35,545
San Francisco Pacific Gas and Electric Co.	$259	$391	$3,292	$84,066
Phoenix Arizona Public Service co.	$165	$281	$1,916	$41,194
Denver Public Service Co. of CO	$118	$190	$1,371	$33,510
St. Paul, Minn Northern States Power Co.	$153	$209	$1,617	$41,827
Washington D.C. Potomac Electric Power Co.	$113	$203	$1,705	$44,885
Miami, Fla. Florida Power and Light Co.	$99	$149	$1,177	$31,789
New York Con. Edison Co. of NY	$265	$406	$2,667	$63,103
Honolulu, Hi Hawaiian Electric Co.	$310	$489	$3,905	$110,507

Unfortunately, the City fell on some hard times in the 1980s. "Once the grandest city in the state, Spokane's bustling urban environment and vital community health have faded over the last quarter of the 1900s" (City of Spokane 2015, p. 2.1.7). Higher income households were moving out of the City leaving an urban core of poverty. From 1985 to 1995, total assessed valuation of property in the County grew to almost a billion dollars higher than that in the City, nearly a 400 percent increase in the difference in just 10 years (City of Spokane 2015). From the late 1980s to the early 1990s the economy of Downtown Spokane was struggling. There was gang activity, drug activity, and the City was in danger of losing its retail core (DSP 2015). The redevelopment of River Park Square in the late 1990s was pivotal in turning around the economy of the City's urban downtown (DSP 2015). The opening of River Park Square in 1999 "strengthened Downtown's position as the retail center of the Inland Northwest" (MIG, Inc. 2008, p. 20). The late 1990s also brought major investments in downtown office buildings and millions of dollars were invested in fiber optic infrastructure (City of Spokane 2015, p. 6). The economic upturn of the City occurred after the discovery of PCBs in the River in the early 1980s.

The Spokane economy has continued to diversify in the past 20 years, moving from a strong heritage of natural resource-related timber, agriculture, and mining to an economy that includes high tech and service companies. The healthcare sector, public employers, manufacturing, and the military (Fairchild Air Force Base) serve as the major industries (City of Spokane 2015, p. 5). Spokane's convention and tourism industry "continues to develop as a major component of the Spokane regional economy" (City of Spokane 2015). The Spokane Riverfront is the location of the Riverpoint campus, which is part of Spokane's University District "located near the heart of downtown along the beautiful Spokane River."[19] The campus houses programs from Eastern Washington University and Washington State University Spokane with Gonzaga University across the River. The WSU campus recently added a new medical school. Along with the Gonzaga medical school, Spokane has now surpassed Seattle as having the largest number of incoming medical students in the State (Long 2018).

The economy of Spokane tracked along with the economic growth of the State of Washington until the post-recession era when Spokane began to lag behind the state as

[19] https://sites.ewu.edu/mfa/the-place/riverpoint-campus/

a whole in economic growth. There is no indication that the discovery of PCBs in the River in the early1980s affected the Spokane economy. "Spokane has long been known as a sleepy place with slow growth that chugged along in the shadow of much larger and richer Seattle" (Geranios 2018). Spokane does not have any large dominant employers like Boeing or Microsoft like Seattle, but it does have a lot of smaller companies, plus a growing number of good paying jobs in government, higher education and medicine (Geranios 2018). Fairchild Air Force Base is the region's largest single employer. According to Grant Forsyth, chief economist for Avista Corp., the region's electric and gas utility, the City has recovered from the recession. The City has currently exceeded the job level at the peak of the last expansion (Geranios 2018).

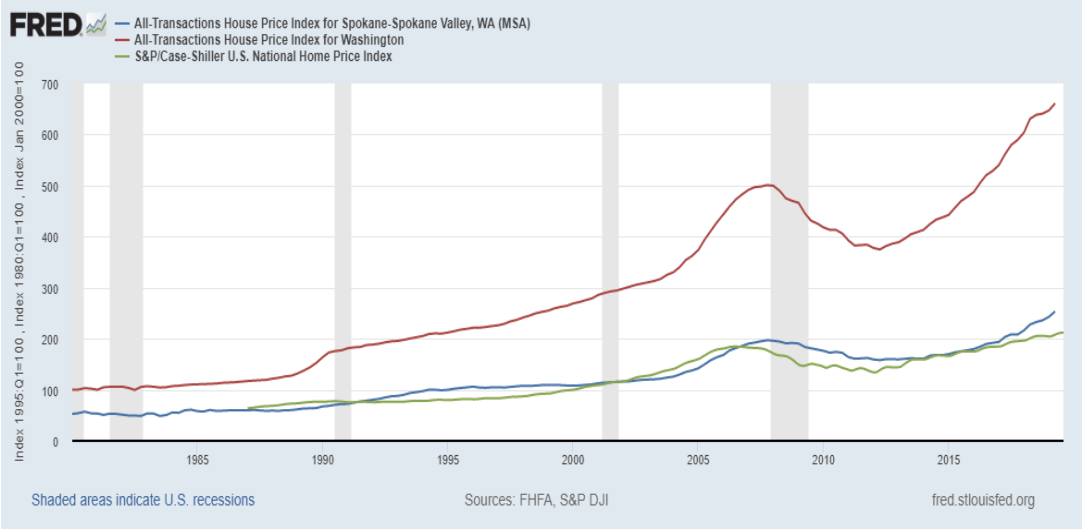
The River's economic value does not lie solely as a source for power and industry. Tourism is an important aspect of the Spokane economy and the River provides the centerpiece. "Our regional community recognizes that one of our greatest assets is the quality of the environmental setting in which we live and the recreational activities available to our residents and tourists" (CEDS 2017, p.24). In 2015, visitors to Spokane County spent $947 million, supporting jobs for more than 10,000 residents and generating $60.9 million in non-resident tax dollars for the County (CEDS 2017, p. 24). Tourism has continued to grow around the development of the Riverfront. A 2012 tourism research study conducted by Randall Travel Marketing (RTM) documented that "visitors rate their satisfaction with Spokane highly, and return to Spokane frequently" (RTM 2012, p. 2). The RTM study found that hotel occupancy in Spokane outperformed national averages in 2009 and 2010. More recently, Spokane has experienced a renewed interest from travelers. TripAdvisor named Spokane one of seven "rising U.S. cities" and named the City among the top-tier bucket list destinations for 2019 (Edelen 2018)[20]. Kate Hudson, spokeswoman for convention and visitors' bureau Visit Spokane, said there has been an increase in tourism over the past five years, with the city drawing more than $1.3 billion in tourism spending in 2017. "I expect it to be more next year," she said (Edelen 2018).

The housing economy in Spokane has shown slower growth than the State of Washington but similar to the United States as a whole (Figure 12) (FRED).[21] However,

[20] The six other cities TripAdvisor name as travel hot spots include Annapolis, Maryland; Reno, Nevada; Richmond, Virginia; Louisville, Kentucky; Chattanooga, Tennessee; and Tucson, Arizona.
[21] https://fred.stlouisfed.org/series/ATNHPIUS44060Q

there is no indication of any price effect in Spokane housing market after the PCB discovery in the late 1980s (FRED; Feist 2019, 216:18-23). Comparing data on price per square foot in Spokane compared to cities of similar size in the State show that Spokane's growth in price per square foot has followed a similar trend (Zillow.com). The housing market in Spokane continues to be strong. The apartment vacancy rate has fallen from 4.2% in 2012 to 1.6% in 2016 and rents have risen 25% in the same time period (Kiemle & Hagood Company 2017). Properties along the River or with River access command a premium like all water bodies in the region (Feist 2019, 210:18-211:10). The City does not discount taxes for properties that abut the River because of the presence of PCBs (Feist 2019, 178:25-179:4).

Figure 12: House Price Index (from fred.stlouisfed.org[22])



Spokane has received attention in the media as a great place to live. In 2013, Outside Magazine conducted a study to determine the best places to "live well." They started with the American College of Sports Medicine's annual list of the country's 50 healthiest cites and added a few small and midsize active towns that the "metro-centric pool" overlooked. By interviewing runners, cyclists, climbers and surfers they narrowed the field to ten places, which included Spokane, "where it's easy to eat healthy, find work and quickly access great trails, beaches, and mountains" (Dickman 2013). Realtor.com ranked Spokane as the "most affordable outdoorsy city" in 2018 (Lambert 2018). Cities with median home prices below $300,000 were ranked using the following criteria: share of homes with outdoor patios, outdoor kitchens, and decks; bicycle-friendliness rating;

[22] fred.stlouisfed.org

per capita kayaking, rafting, and outdoor gear stores, number of campgrounds, share of restaurants with outdoor seating; per capita of conservation scientists and foresters; number of national parks in the state; percentage of residents who live within a 10-minute walk of a park. Spokane was also included in National Geographic Traveler's magazine's ranking as one of the best small U.S. cities in 2018 as well as one of the best "hipster cities" by Movehub (Kramer 2018). In 2018, livability.com rated Spokane, Washington the number seven best place to retire noting the "breathtakingly beautiful" 100-acre Riverfront Park, plethora of outdoor activities, and affordability[23]

The City continues to invest money in the riverfront and downtown. Expenditures per capita on parks and recreation have increased 13 percent in real numbers since 2005 (43 percent to 74 percent in nominal) (Spokane Trends (a)). In 2014, Spokane citizens overwhelmingly approved a $64 million bond to improve and redevelop Riverfront Park, the former site of the Expo '74 World's Fair (City of Spokane). "Spokane is in the midst of major transformations, with $800 million in public and private investments pouring into the city's downtown and nearby neighborhoods" (Kramer 2017). These projects include rehabilitation of historic Spokane buildings as well as new construction. Many of these development plans are right on the banks of the River. Some of the most significant projects, in addition to the $64 million Riverfront Park redevelopment, include the transformation of the Wonder Bread Building on the north side of the River into office space, $12.5 million. A number of downtown housing projects are included in the $800 million: 1400 Tower, 14-story condo tower overlooking the Peaceful Valley neighborhood; The M, a mixed-use housing and retail conversion of the old Macy's building downtown; Ridpath Club Apartments and Condos, a 214-unit housing project targeted to working-class and professionals earning less than $30,000 per year; Kendall Yards, mixed-use residential, commercial and office development of a 77-acre former industrial railroad site on the banks of the River; The Falls, mixed-use residential, commercial and office space on the old YMCA property on the River's north bank (Kramer 2017). Most notable, the Kendall Yards development along with the Summit Parkway creates a greenway system of parks along the River with open space and protected lands that is managed for multiple uses including: nature protection, biodiversity management, water resources, recreation, and cultural/historic landscape

[23] https://livability.com/top-10/retirement/best-places-to-retire/2018/wa/spokane

protection.[24] The parks include the Great Spokane Gorge Park and the Centennial Trail linear corridor, Cedar Plaza and Olmsted Brothers Green. The City agrees that PCBs did not cause any of these projects not to be undertaken (Feist 2019, 150:13-15).

In addition, the City has included $15 million in the City's Community Investment Plan for 2018-2019 for improvements in the "Urban Experience" including investments in trails and river access, a North Bank sportsplex, library, and unnamed projects of "citywide significance" and arts and diversity "strategic investments" (City of Spokane 2018).

Moreover, fishing and recreation on the River generates considerable financial and economic value for the region. Fishing related expenditures add to the economy both directly and indirectly. Using an analysis by TCW Economics (2008) of statewide sport fishing in Washington, I am able to estimate the annual economic fishing impacts in the three-county region of the River. Angler trip-related expenditures include food, lodging, transportation, equipment, recreation services and other trip expenses. Surveys of residents living in areas adjacent to the River show a higher rate of angling participation, 25 percent compared to the statewide participation rate of 10 percent (REC Resources and Pinnacle Research 2010; Robinson 2015). Therefore, I estimate a range of economic benefits based on these two levels of participation. Residents and nonresidents in Lincoln, Spokane and Stevens Counties spend $59 to $142 million annually and nonresident anglers spend $4.8 to $11.5 million annually on fishing related expenses for a total of $63.8 to $153 million.[25] These expenditures ripple through the economy creating jobs and income directly and indirectly.[26] The number of jobs created both directly and indirectly by resident and nonresident angler expenditures total 924 to 2,217, creating a total income of $28.6 to $68.6 million annually (Table 4).

[24] https://www.spokesman.com/guides/olmsted-brothers-and-power-public-spaces/stop-52/
[25] Population from https://www.ofm.wa.gov/washington-data-research/population-demographics/population-estimates/april-1-official-population-estimates
[26] An input-output model is used to estimate how spending ripples through the economy. For this analysis, TCW used Implan to estimate the economic effects of angler spending on the economy.

Table 4: Value of Spokane River Angling
(Estimates based on TCW Economics 2008)

	Resident	Nonresident	Total
Expenditures	$ 59.0 - $ 141.7	$ 4.8 - $ 11.5	$ 63.8 - $ 153.2
Direct and Indirect income	$ 26.3 - $ 63.1	$ 2.3 - $ 5.6	$ 28.6 - $ 68.6
Total	$ 122 - $ 168	$ 7.1 - $ 17.1	$ 92.4 - $ 221.8

Although I have only estimated the economic value of fishing in the Spokane area, other recreation activities that occur on the River also provide economic value to residents and visitors. There are a number of white water rafting and river outfitters in Spokane as well as fishing outfitters. The large number of parks and recreation sites located along the River and the popularity of near and in water recreation offers further evidence that the River provides significant economic benefits to residents and visitors.

In summary, although Spokane struggled economically in the late 1980s and early 1990s, redevelopment in the downtown and expansion of the river park system brought the City out of its slump. There is no indication that PCBs, discovered in low-levels in the River in the early 1980s had any impact on the economy of Spokane. In fact, the downtown redevelopment occurred shortly after the discovery. Spokane's economy kept pace with the state until the recession, which hit Spokane hard and Spokane recovered more slowly. Recent measures of tourism and the economy show that Spokane is doing well with a healthy growing economy. The relatively low cost of living compared to larger cities such as Seattle and Portland have attracted potential home owners to the City. The beauty and accessibility of the River to downtown continues to attract businesses, tourists and residents. The City is not aware of an instance where the City lost revenue because of some hypothetical loss of the use of the River because of PCBs (Feist 2019, 178:18-24).

Opinion 4: Conventional water quality pollutants limit recreation in the Spokane River.

Water quality in the River has improved over the last century mainly because of the reduction in untreated sewage discharging into the River (Feist 2019, p. 62:8-23). Sewage entering the River reduces the beneficial use of the River by increasing eutrophication and creating unsafe conditions for water contact (City of Spokane 1977; Army Corps of Engineers 1976). From the nineteenth century until the middle of the twentieth century, the City released raw, untreated sewage directly into the River.[27] In August 1885, an ordinance was passed that forbade the dumping of "excrement, manure and garbage" into the River. "It was true nonetheless, that the City continued to lay sewers that emptied into the Spokane River" (Reisdorph and Wilson 1963, p. 1; Hendron 2019, pp. 26:7-13).

However, the City continued to ignore the sewage problem. The City voted down measures to build a sewage treatment plant in 1933, 1936 and 1939 (Reisdorph and Wilson 1963, p. 3). In 1946, a bond to build a sewage treatment plant was finally passed; however, when the plant was eventually built in 1958, it was undersized and handled less than half of the City's sewage, the remainder continuing to enter the River untreated (Reisdorph and Wilson 1963, p. 3; Hendron 2019, pp. 60:19-25 ; 61:1-3). The City modified the plant in 1961-1962 to provide enough treatment capacity to handle the sewage load of a population equivalent to 250,000 (Reisdorph and Wilson 1963). However, in 1972, the combined sewer overflow annually was 740 million gallons (Esvelt & Saxton-Bovay Engineers Inc. 1972; Hendron 2019; pp. 83:25; 84:1-10).

Over the course of the twentieth century, the State of Washington urged the City to stop dumping sewage in the River stating they were violating state law (Hendron 2019, pp. 44:18-25, 45:1-17). Nevertheless, the City ignored multiple orders over the years and continued to dump untreated sewage (Hendron 2019, p. 74:17-24). "The bacterial analyses and the probable extent of bacterial pollution are evidence that the river below Spokane is, at times, polluted as to make the water hazardous for bathing and recreation" (Butler, p. 2). In the 1950s and 1970s, data showed river densities of total coliform reaching tens of thousands per 100 milliliters, when the standard was 240 per 100 milliliter (Hendron 2019, pp. 157:4-15). The City continues to discharge sewage into the

[27] Marlene Feist confirmed that Ecology used the River as a sewer decades ago (Feist 2019, 63:17-25).

River (Hendron 2019, p. 51:11-17). In addition, combined sewer overflows (CSO) continue to occur allowing untreated sewage and stormwater into the River. In 1976, the U.S. Army Corps of Engineers recommended separating the storm water and sewage treatment to prevent overflows which "are the most serious threat to Spokane River quality" (U.S. Army Corps of Engineers 1976, p. 50).

In 1977, the City's Public Works Department published the Facilities Planning Report for Sewer Overflow Abatement. The report states, "if we abate (the overflows), it will decrease unnecessary exposure of the general community to waterborne pathogenic diseases" (City of Spokane 1977, p. 1). There were high fecal coliform levels in the River after each rainstorm (City of Spokane 1977, p. 8). "The general public's opinion of increasing the water quality of the river and reservoirs is that it would improve the economic and recreational value of the river and the shoreline properties" (City of Spokane 1977, p. 10). In 1994, it was reported that 469 overflow events occurred totaling 78.64 million gallons (City of Spokane 1999). In 2008, the Sierra Club sued the City of Spokane over the repeated discharges of untreated sewage into the River. The City reached a settlement agreement (Hendron 2019, p. 225:4-12). Even now, "one would not want to be swimming near or downstream of a combined sewer overflow point during a rainstorm because of potential sewage in the River" (Hendron 126:4-11).

In 2000, The Washington State Department of Ecology notified the City of Spokane that the City would be required to provide public notification of CSO occurrences and CSO impacts by posting signs in conspicuous locations (Exhibit 28, Hendron 2019, pp. 196-197). The signs posted at CSO outflows read "Warning. Possible sewage overflows during and following heavy rain/snow melt. If you see a sewage overflow, make a note of this CSO number and call 344-FISH" (Feist Exhibit 48, Feist 2019, p. 167:10-13).[28] These signs protect people from the possible health effects of fecal coliform contaminants by making the public aware, but also create limitations to the use of the River. The City has never warned the public that engaging in recreation and tourist activities in and around the River could be harmful to one's health because of PCBs (Feist 2019, p. 152:5-12).

[28] Marlene Feist confirmed that there is no mention of PCBs on the sign (Feist, p.167, 14-16).

Sewer overflows, as well as point and nonpoint source pollution, also contribute to eutrophication of Long Lake. It was noted in 1977 that overflows add excess nutrients, such as nitrogen and phosphorus that contribute to eutrophication (City of Spokane 1977, p. 8). Excess nutrients cause nuisance plant and algae growth that leads to oxygen levels falling as the plant matter decays. Excess plant and algae growth can interfere with some water-based recreation such as swimming, boating, paddle boarding and fishing and can also reduce waterfront property values (Michael, Boyle and Bouchard 2000). Excess plant growth in Lake Spokane and Nine Mile Reservoir limits recreational use of the area in certain times of the year. A 2007 survey measured 715 acres of Lake Spokane were covered with invasive weeds (Armes 2012).

A survey conducted in 2016 indicated a total of 1,479 acres of aquatic vegetation in Lake Spokane and 46.9 acres in Nine Mile Reservoir (Avista Corporation 2019). Avista Corporation has been managing program funding for the Lake Spokane and Nine Mile Reservoir aquatic weed management program that includes hand removal, herbicides and winter water drawdowns. Herbicides are used in specific recreation areas with boat launches (Avista Corporation 2019).[29]

Toxic algae blooms that may cause human illness and be harmful to pets and livestock occasionally occur in Lake Spokane (Hamel 2012). Even when not producing toxins, "blue-green blooms are distressing to lake residents and the public because they are unsightly and smelly when decomposing, can affect recreational use, and can cause economic losses to lake-based businesses like resorts" (Hamel 2012, p. 2). Blue-green blooms typically occur when phosphorus and nitrogen levels are high. These nutrients enter the waterway through point and nonpoint pollution sources such as stormwater inputs, agricultural runoff, and urban land use practices (Hamel 2012). These blooms only occur in Lake Spokane and not in the River.

In 2006, Ecology funded DOH to develop a statewide strategy to help local health authorities protect the public from toxic blooms in Lake Spokane. The protocol includes posting signs warning the public of the toxins in the water. The warning signs state that

[29] In 2018, the following recreation sites on Lake Spokane were treated with herbicides to reduce invasive plant growth: Spokane Lake Park Community Boat Launch, Nine Mile Recreation Area, West Shore Boating Lane, Nine Mile Boating Lane, Lake Ridge Park Community Boat Launch, Suncrest Community Boat Launch, West Shore Community Boat Launch, Lake Forest Community Boat Launch, Willow Bay Resort/Lakeview, Lakeshore Estates. In addition, 15 acres of area in Nine Mile Reservoir were treated for milfoil and other nuisance weeds (Avista Corporation 2019).

"the lake is unsafe for people and pets: Do not swim or water ski, Do not drink lake water, Keep children, pets, and livestock away, Clean fish well and discard guts, Avoid areas of scum when boating" (Figure 13)(Hamel 2012). These signs are posted when toxin concentrations are above the Washington State Recreational Guidance values (Table 5).[30]

Figure 13: Washington State Warning Signs for Toxic Algae (https://www.nwtoxicalgae.org/HealthRisks.aspx)

Table 5: Lake Spokane Testing for Algae Toxins (downloaded from https://www.nwtoxicalgae.org/Data.aspx)

Year	Number of Exceedances of Recreation Guidance
2015	4
2012	1
2011	3
2010	9
2009	2

[30] https://www.nwtoxicalgae.org/HealthRisks.aspx

"Metals have been a concern for a long time" (Hendron 2019, 112:20-21). Since the late 1800s, mining and ore-processing activities in the South Fork Coeur d'Alene River basin have altered the water quality, aquatic biological, and hydrologic conditions in the 6,680-mi^2 Spokane River basin of northern Idaho and eastern Washington. Historical ore-processing activities resulted in large quantities of metal-rich tailings that were placed in and along streams (Long 1998 cited in Donato 2006). Metals continue to be transported out of Lake Coeur d'Alene and into the River. The River has frequently exceeded water quality standards for several metals (City of Spokane 2004, p. 2-3). The exceedances have been attributed to historic mining activities in Idaho (City of Spokane 2004, p. 2-3). These metals bioaccumulate in fish and contribute to consumption advisories. The first fish consumption advisory on the River was based on lead (Washington State Department of Health 2007).

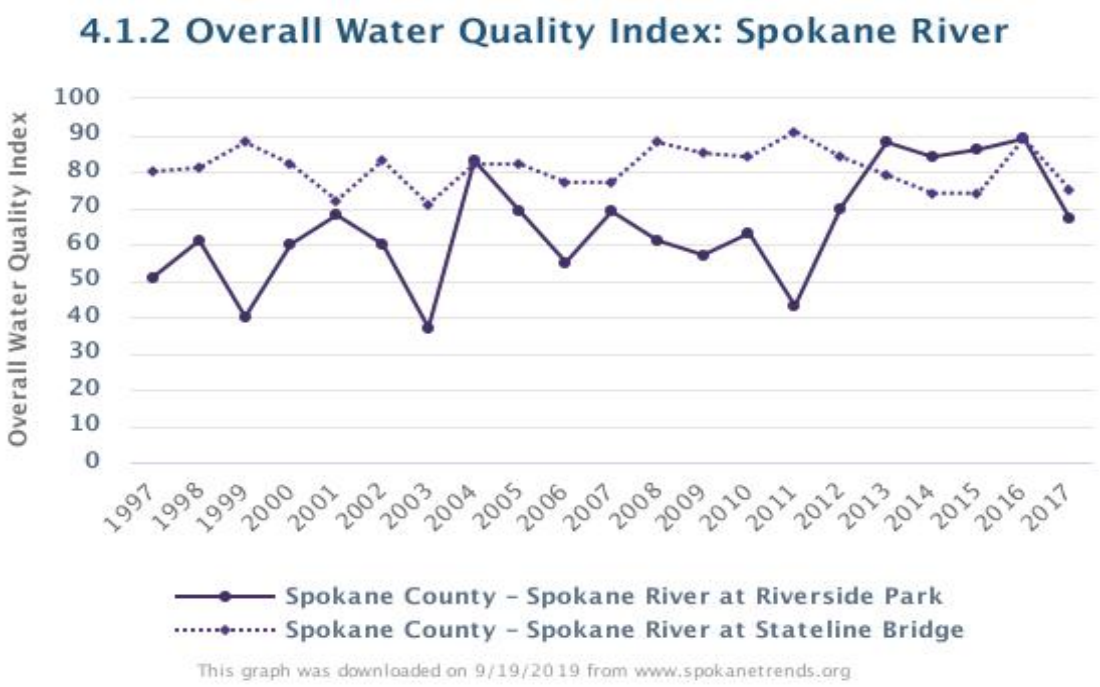
Permits for discharge at treatment facilities place limits on BOD, total suspended solids, fecal coliform bacteria, pH, ammonia, residual chlorine, phosphorus, cadmium, lead and zinc but not PCBs (State of Washington Ecology 2000, p. 6). According to Lars Herndon, there has never been a quantitative limit on PCB discharge from the City's Riverside Treatment facility (Hendron 2019, p. 195:8-11). A study prepared by LimnoTech for the Toxics Task Force for the 2016 Comprehensive Plan finds that the average concentrations of PCBs at all stations show compliance with the current Washington State water quality standard of 170 picograms per liter (p. 19).

Perceived differences in water quality are important factors in determining the levels of recreational uses. A Water Quality Index (WQI) has been used to evaluate water quality in the River since 1993.[31] The WQI is based on temperature, pH levels, fecal coliform bacteria, dissolved oxygen, nitrogen and phosphorous levels. PCBs are not measured as part of the WQI. The WQI ranges from 1 to 100 with 100 being the best. The index is expressed in terms of the water quality levels that are required to maintain various uses of the River specified in WAC 173-201A (Spokane Trends (b)). In 2017, the overall water quality index of the River was measured at Riverside Park at 67 and at Stateline Bridge at 75. Overall water quality has improved 16 points at Riverside Park and 5 points at Stateline Bridge since the beginning of the series in 1997 (Figure

[31] Numerous economic studies have used water quality indices in evaluating recreation use includes (Vaughan and Russell 1982; Smith and Desvousges 1986). The index discussed above is analogous to the ones used in these studies.

13). According to DOE, stations scoring between 40 and 79 indicate "marginal concern" (Spokane Trends (b)). Brook Breeler of the Department of Ecology states, the Spokane River is "swimmable and safe to recreate in" (Silbernagel Mccaffree 2014). The City agrees that recreational uses of the River have increased since the 1970s (Feist 2019, p. 163:13-164:12).

Figure 13: Water Quality Index Measurements on the Spokane River Over Time (Spokane Trends (b))



Finally, another important source of information about the quality of the water in the River and the lack of an impact from PCBs can be found in the intercept survey of residents who live along the River. One would expect that this group of individuals who live closest to the water and use it extensively would have the most direct experience with any potential problems in the River. The residents interviewed cited water levels and water flow as concerns, along with litter and algal blooms. These open-ended questions provided the residents with the best opportunity to express their concerns with a minimum of potential bias from leading questions and they never mentioned PCBs as a concern (REC and Pinnacle Research 2010; Robinson Research. 2015).

4. CONCLUSIONS

The City is not a Trustee for the River, and therefore, cannot make a claim for natural resource services derived from the River. The City has not conducted an assessment of natural resource service losses resulting from an injury to the resource nor proposed any compensating restoration projects.

The City drew its lifeforce from the River when the City was founded over a century ago, and it continues to draw on it today. The presence of PCBs in the River has not limited the City's or its residents' enjoyment of the River, beneficial uses of the River, economic development along the River or the business there. The River continues to be the greatest source of recreation and outdoor leisure for residents and visitors. The City continues to focus its recreation dollars on improving access to the River and recreation in and along the River. There is no indication that PCBs have diverted the City's focus from the River for outdoor recreation.

The River is known for its great trout fishing and is a favorite spot for fly fishing. Hatchery trout continue to be stocked in the River for taking. Research shows that limited advisories have little, to no, impact on fishing and catch and release fishing is increasingly popular not just in areas with restricted consumption. Fly fishing, in which catch and release is routinely practiced, is also prevalent. The City has not conducted any studies that provide evidence that angler's enjoyment of fishing has been impaired by FCAs or that FCAs has reduced the use of the River (Feist 2019 94:15-24; 298:25-299:7).

The economy of Spokane is tied to the River, from the early days of the River, as an input and support to industry, to currently as a draw for business, tourism, and residents. Spokane continues to be part of the Inland Northwest hub of trade. Economic data shows no negative impact from the discovery of PCBs on the economy of Spokane. In fact, it was shortly after the discovery of low-levels of PCBs in the early 1980s that Spokane entered into a period of revitalization in its downtown corridor. Median house prices continue to track along with similar sized cities in Washington. Tourism indicators showed no sign of deflection post PCBS and has even shown an uptick in the most recent years. PCBs have not impacted the ability of the City of Spokane to do business.

Finally, water quality in the River has greatly improved over the last century by reducing the amounts of untreated waste entering the River. Corresponding recreational

uses have increased as the water quality has improved. Nevertheless, the City has failed to eliminate the sewage problem for decades. Even after the development of sewage treatment facilities in the 1960s, the inadequate design has resulted in continued overflows of sewage into the River during heavy rains. The City's inability to properly treat wastewater has contributed to overgrowth of nuisance plants and the occurrence of algae blooms in Lake Spokane, which at times decreases the beneficial uses of the Lake in some areas. None of these detrimental impacts to the River are related to PCBs.

5. REFERENCES

Armes, David. 2012. Spokane River Project: Lake Spokane Aquatic Weed Program Funding. Avista Corporation. Presentation.

Arskey, Laura. 2005. "Spokane – Thumbnail History." HistoryLink.org Essay 7462. Accessed on September 30 at: http://www.historylink.org/File/7462

Avista Corporation. 2005. Application for New License, Major Project – Existing Dam. Spokane River Hydroelectric Project, FERC Project No. 2545. Volume I: Exhibits; Volume II: Applicant-Prepared Preliminary Draft Environmental Assessment. Avista Corporation, Spokane, Washington, July 2005.

Avista Corporation. 2017. Lake Spokane Dissolved Oxygen Water Quality Attainment Plan Five Year Report. March 24.

Avista Corporation. 2019. Lake Spokane and Nine Mile Reservoir 2018 Aquatic Weed Summary Report. February 22

Bartlett, Bob. 2018. "Two Fly-Fishing Love Stories." *The Spokane River* Edited by, Paul Lindholdt. University of Washington Press. Pages 45-52.

Berger. 2004. Recreation Facility Inventory and User Surveys Report, Spokane River Project, No. 2545. April.

Block, Alexa. 2018. "University District bridge project six weeks behind schedule, officials say progress is being made." Accessed September 30, 2019 at: https://www.krem.com/article/news/local/spokane-county/university-district-bridge-project-six-weeks-behind-schedule-officials-say-progress-is-being-made/293-598110726

Butler, A.D. 1933. Spokane Washington: Report on Sewage Disposal. July. (Exhibit D, Hendron 2019).

CEDS. 2015. Spokane Regional Comprehensive Economic Development Strategy for the Spokane Region 2014-2015.

CEDS. 2017. Spokane Regional Comprehensive Economic Development Strategy for the Spokane Region.

City of Spokane. "Riverfront Spokane." Accessed September 30, 2019 at: https://my.spokanecity.org/riverfrontspokane/redevelopment/

City of Spokane. 1977. Facilities Planning Report for Sewer Overflow Abatement. City of Spokane Public Works Department.

City of Spokane. 1999. CSO Annual Report.

City of Spokane. 2004. Stormwater Management Plan.

City of Spokane. 2015. Comprehensive Plan. June.

City of Spokane. 2018. 2018-2019 Community Investment Plan.

Cotton, Monique. 2015. "City Parks and Recreation Opens New Downtown Spokane River Access Point." August 26. Accessed November 6 at: https://my.spokanecity.org/news/stories/2015/08/26/city-parks-recreation-opens-new-downtown-spokane-river-access-point/

Culver, Nina. 2018. "Conservation Future program buys land, Spokane River shoreline from the Sisters of the Holy Names". The Spokesman-Review. April 21.

Deshais, Nicholas. 2014. "Riverfront Park face-lift seen as a legacy project." The Spokesman Review. September 28. Accessed September 30, 2019 at https://www.spokesman.com/stories/2014/sep/28/riverfront-park-face-lift-seen-legacy-project/

Deshais, Nicholas. 2018. "U-District's $15.4 million bridge finished, but controversy over delays and bike landing continue". The Spokesman Review. December 20.

Desvousges, W.H., D.J. MacNair, and G.A. Smith. 2000. *Lower Fox River and Green Bay: Assessment of Potential Recreational Fishing Losses and Restoration Offsets.* Durham, NC: Triangle Economic Research.

Dickman, Kyle. 2013. "Best Town Ever 2013". Outside Magazine. August 12. https://www.outsideonline.com/1929121/outsides-best-towns-2013

Donato, Mary. 2006. Annual Trace-Metal Load Estimates and Flow-Weighted Concentrations of Cadmium, Lead, and Zinc in the Spokane River Basin, Idaho and Washington, 1999-2004. USGS Scientific Investigations Report 2006-5188.

Downtown Spokane Heritage Walk. "Spokane History." Accessed on September 30 at: http://www.historicspokane.org/HeritageTours/downtown/history.html

DSP. 2015. "The Beginning of a Legacy." Downtown Spokane Partnership. https://my.spokanecity.org/economicdevelopment/news/

Ecology. 2011. Spokane River PCB Source Assessment 2003-2007. Publication No. 11-03-012. April

Edelen, Amy. 2018. "Urban and outdoors mix to make Spokane a destination must, according to popular travel website TripAdvisor". The Spokesman-Review. October 23.

Esvelt & Saxton -Bovay Engineers, Inc. 1972. Spokane Wastewater Study. July

Feist, Marlene. 2019. Videotaped deposition of Marlene Feist in the Matter of *City of Spokane v. Monsanto, Solutia, and Pharmacia Corporation.* United States District Court Eastern District of Washington. Case No. 15-cv-00201-SMJ. July 16.

FERC. 2007. Final Environmental Impact Statement for Hydropower Relicensing, Spokane River and Post Falls Hydroelectric Projects, States of Washington and Idaho, FERC Projects NOs. 2545 and 12606. July 20.

Francovich, Eli. 2018a. "State money pours into Spokane-area recreation projects". The Spokesman-Review". April 5.

Francovich, Eli. 2018b. "Two Spokane County recreation projects receive $1.5 million in grant money". Spokesman-Review. May 15.

Geranios, Nicholas 2006. "Kaiser Aluminum emerges from bankruptcy proceedings." The Seattle Times. Accessed September 30 at http://community.seattletimes.nwsource.com/archive/?date=20060706&slug=webkaiser06

Geranios, Nicholas. 2018. "Growing Spokane, Washing, Sheds Is Sleepy City Image." Associated Press. August 11.

Gonzaga University. "Activities and Things to Do." Accessed on September 30, 2019 at: https://www.gonzaga.edu/about/our-campus-location/spokane-our-community/activities-things-to-do

Hamel, Kathy. 2012. Aquatic Algae Control Program: Report to the Washington State Legislature (2010-2011). Publication no. 12-10-016. May.

Hendron, Lars. 2019. Videotaped deposition of Lars Hendron in the Matter of City of Spokane v. Monsanto, Solutia, and Pharmacia Corporation. United States District Court Eastern District of Washington. Case No. 15-cv-00201-SMJ. June 7.

Hill, Kipp. 2018. "Mayor David Condon puts focus on River, city's kindness in State of City address". The Spokesman Review. UPDATED: Fri., Feb. 9, 2018, 10:08 p.m.

Jakus, P., Downing, M., Bevelhimer, M., and Fly, J. 1997. "Do Sportfish Sportfish Consumption Advisories Affect Reservoir Anglers' Site Choice?" *Agricultural and Resource Economics Review*, 26(2), 196-204.

Joint Administration Council. 2017. 6-Year Strategic Plan for City of Spokane.

Jones, Jacob. 2014. "Outlander: Tonight's Northern Lights, fishing news and the Huckleberry ack". *Inlander*. Friday, September 12.

Kershner, Jim. 1995. "River of Kings in Years Past, The Spokane River Was Home to Millions of Salmon, Which Brought Bounty to the Regions Tribes". The Spokane Review. August 21.

Kiemle & Hagood Company. 2017. Market Review and Outlook 2017. Published in Partnership with Avista.

Klingle, Mathew. "Building Nature: Topics in the Environmental History of Seattle and Spokane". A Curriculum Project for Washington Schools. Center for the Study of

the Pacific Northwest. University of Washington Department of History. http://www.washington.edu/uwired/outreach/cspn/Website/Classroom%20Materials/Curriculum%20Packets/Building%20Nature/V.html

Kopp, Raymond J., and V. Kerry Smith, eds. 1993. *Valuing Natural Assets: The Economics of Natural Resource Damage Assessment.* Washington, DC: Resources for the Future.

Kramer, Becky. 2017. "9 Projects That Will Transform Spokane's City Center". Spokesman-Review. June 25. http://www.spokesman.com/stories/2017/jun/25/9-projects-that-will-transform-spokanes-city-cente/

Kramer, Becky. 2018. "Spokane among 'Cities on the Rise,' according to National Geographic Traveler magazine". The Spokesman-Review. January 16. http://www.spokesman.com/stories/2018/jan/16/spokane-among-cities-on-the-rise-according-to-nati/

Lambert, Lance. 2018. "America's Most Affordable Outdoorsy Cities, 2018: Open-Air Adventure, at Cut-Rate Costs". Realtor.com. https://www.realtor.com/news/trends/10-cities-where-outdoor-lovers-can-actually-afford-to-live/

Landers, Rich. 2010. "Spokane River is year-round attraction for local fly fisher." February 21. Accessed on September 30, 2019 at: https://www.spokesman.com/stories/2010/feb/21/home-water/

Landers, Rich. 2012. "Landers: Fly fishing shines in Inland Northwest." June 28. Accessed on September 30, 2019 at: https://www.spokesman.com/stories/2012/jun/28/landers-fly-fishing-shines-in-inland-northwest/

Landers, Rich. 2014. "State, Avista join to stock trout in Lake Spokane". The Spokesman-Review. June 4. http://www.spokesman.com/blogs/outdoors/2014/jun/04/state-avista-join-stock-trout-lake-spokane/

LimnoTech. 2016. 2016 Comprehensive Plan to Reduce Polychlorinated Biphenyls (PCBs) in the Spokane River. Prepared for Spokane River Regional Toxics Task Force. November 16.

Long, Katherine. 2018. "Spokane's two medical schools draw more new docs to Eastern Washington". The Seattle Times. November 4. https://www.seattletimes.com/seattle-news/spokanes-two-medical-schools-draw-more-new-docs-to-eastern-washington/

MacNair, Douglas and William Desvousges, (2007), "The Economics of Fish Consumption Advisories: Insights from Revealed and Stated Preference Data", *Land Economics,* Vol. 83, No.4, pp.600-616.

Maeder, Steve. "Spokane River, WA." Accessed September 30, 2019 at: https://northwest-fly-fishing.myshopify.com/blogs/features/15714004-spokane-river-wa

Market Fact Book. 2019. Journal for Business. Spokane and Kootenai Counties.

Marshall, Todd. 2018. "Of Nudity and Violence, Waking and Water." *The Spokane River.* Edited by, Paul Lindholdt. University of Washington Press. Pages 15-25.

Meinig, Donald W. 2005. "Spokane and the Inland Empire: Historical Geographic Systems and a Sense of Place." *Spokane and the Inland Empire: An Interior Pacific Northwest Anthology*. Edited by, David H. Stratton. Washington State University Press. Pages 15-44.

Michael, Holly J., Kevin J. Boyle and Roy Bouchard. 2000. "Does the Measurement of Environmental Quality Affect Implicit Prices Estimated from Hedonic Models?" *Land Economics*. May 76(2): 283-298.

MIG, Inc. 2006. City of Spokane Valley Park and Recreation Plan. April.

MIG, Inc. 2008. Fast Forward Spokane: Downtown Plan Update. November 24.

National Research Council. Valuing Ground Water. Washington, DC: National Academy Press, 1997.

Office of Financial Management. 2019. "State of Washington 2019 Population Trends." https://www.ofm.wa.gov/sites/default/files/public/dataresearch/pop/april1/ofm_april1_poptrends.pdf

Outdoors OutThere. "9 Ways to Explore the Spokane River Trail." Accessed on September 30, 2019 at: https://outthereoutdoors.com/9-ways-to-explore-the-spokane-river-water-trail/

Parsons, G.R., P.M. Jakus, and T. Tomasi. 1999. "A Comparison of Welfare Estimates from Four Models for Linking Seasonal Recreational Trips to Multinomial Logit Models of Site Choice." *Journal of Environmental Economics and Management* 38: 143–57.

Pinnacle Research and Consulting. 2016. 2016 Spokane River Recreation Site Visitation: Spokane River Project. Prepared for Avista Utilities Corporation. November.

Randall Travel Marketing. 2012. Visit Spokane 2012 Tourism Research Study.

REC Resources and Pinnacle Research. 2010. Spokane River Project: Recreation Monitoring Report. Prepared for Avista Utilities. May.

Reisdorph, A.J. and G.M. Wilson. 1963. Welcome to the City of Spokane Sewage Treatment Plant n. 4401 A.L. white parkway Spokane 14, Washington.

Responsive Management. 2012. Results of General Population Survey in Support of the Development of the Washington State Comprehensive Outdoor Recreation Plan. Conducted for the Washington Recreation and Conservation Office.

Riverfront Park Master Plan. Fall 2014.

Robinson Research. 2015. Spokane River Water Quality Survey. Prepared for the Spokane River Forum. May.

Silbernagel Mccaffree, Amy. 2014. "Is It Safe To Swim In The Spokane River?" August 11, 2014 Get Out Therewatersports

Smith, V.K., and W.H. Desvousges. 1986. Measuring Water Quality Benefits. Boston: Kluwer Nijhoff.

Spokane Historical. "Washington Water Power." A project of the Public History Program at Eastern Washington University. Accessed on September 30 at: https://spokanehistorical.org/items/show/498

Spokane Portland & Seattle Railway Historical Society. "History." Accessed on September 30, 2019 at: https://www.spshs.org/history.html

Spokane Regional Health District. 1998. 1998 Fish Consumption Survey, Spokane River Washington. November.

Spokane River Forum (a). "Explore! The Spokane River Water Trail." Accessed on September 30, 2019 at: https://www.spokaneriver.net/watertrail/

Spokane River Forum (b). "Check out Redband Launch." Accessed on September 30, 2019 at: https://spokaneriver.net/news/check-out-redband-launch/

Spokane Trends (a). "Culture and Recreation." Accessed on September 30, 2019 at: http://spokanetrends.org/graph.cfm?cat_id=1&sub_cat_id=2&ind_id=1

Spokane Trends (b). "Environment: 4.1.2 Overall Water Quality Index: Spokane River." Accessed on September 30, 2019 at: http://www.spokanetrends.org/graph.cfm?cat_id=4&sub_cat_id=1&ind_id=4

State of Washington, Department of Ecology. 2000. National Pollutant Discharge Elimination System Waste Discharge Permit No. WA-002447-3.

Stratton, David H. 2005. "The Inland Empire: Introduction to the Original Edition (1991)." *Spokane and the Inland Empire: An Interior Pacific Northwest Anthology*. Edited by, David H. Stratton. Washington State University Press. Pages 1-5.

TCW Economics. 2008. Economic Analysis of the Non-Treaty Commercial and Recreational Fisheries in Washington State. December.

The Lands Council. "Spokane River Urban Waters Community Education and Outreach Program Material Development Proposal".

Titone, Julie. 2018. "River Lessons." *The Spokane River* Edited by, Paul Lindholdt. University of Washington Press. Pages 36-44.

Trapp, J. Michael and Joel E. Bowdan. 2019. Expert Opinion Report of J. Michael Trapp and Joel. E. Bowdan III. *City of Spokane v. Monsanto Company, et al.* October 11.

U.S. Army Corp of Engineers. 1976. Metropolitan Spokane Region Water Resources Study. Technical Report. January.

U.S. Department of a Health and Human Services. 2007. Evaluation of PCBs, PBDEs and Selected Metals in the Spokane River, Including Long Lake: Spokane Washington. August 28.

Vaughan, W.J. and C.S. Russell. 1982. Freshwater Recreational Fishing: The National Benefits of Water Pollution Control, Washington, DC: Resources for the Future, Inc., November 1982

Visit Spokane. "Huntington Park." Accessed September 30, 2019 at: https://www.visitspokane.com/listing/huntington-park/22887/

Washington State Department of Health. 2007. Evaluation of PCBs, PBDEs and Selected Metals in the Spokane River, Including Long Lake, Spokane Washington. August 28.

Washington State Employment Security Department. Spokane County Profile. Accessed on September 30, 2019 at https://esd.wa.gov/labormarketinfo/county-profiles/spokane

Washington State Parks. "Riverside Park." Accessed on September 30, 2019 at: https://parks.state.wa.us/573/Riverside

Washington State University. "Why WSU Spokane?" Accessed September 30, 2019 at: https://spokane.wsu.edu/studentaffairs/why-wsu-spokane/

Wong, Siena. 2018. Evaluation of Fish Hatcheries as Sources of PCBs to the Spokane River. Department of Ecology State of Washington Publication No. 18-03-014. April.

Youngs, J. William T. 1996. *The Fair and the Falls: Spokane's Expo '74 : Transforming an American Environment.* Eastern Washington Univ Press.

Appendix A

Resume of William H. Desvousges, Ph.D.

William H. Desvousges, Ph.D.
President

W.H. Desvousges & Associates, Inc.
168 Spartina Ave.
St. Augustine, FL 32080
Cell: 919-413-6225
william.desvousges@whdesvousgesassociates.com

Employment Chronology

2005 to date	**President** W.H. Desvousges & Associates, Inc.
1994 to 2005	**President** Triangle Economic Research Durham, NC
1996 to 1999	**Research Professor** Duke University Durham, NC
1989 to 1994	**Program Director/Senior Program Director** Center for Economics Research Research Triangle Institute Research Triangle Park, NC
1980 to 1989	**Senior Economist** Center for Economics Research Research Triangle Institute Research Triangle Park, NC
1975 to 1980	**Assistant/Associate Professor** Department of Economics University of Missouri at Rolla Rolla, MO
1986	**Visiting Lecturer** Meredith College Raleigh, NC
1984 to 1985	**Visiting Lecturer** University of North Carolina at Chapel Hill Chapel Hill, NC
1980 to 1984	**Visiting Lecturer** North Carolina State University Raleigh, NC

Education

Ph.D., 1977, Economics, Florida State University, Tallahassee, Florida

M.S., 1974, Economics, Florida State University, Tallahassee, Florida

B.A., 1972, Economics, Stetson University, Deland, Florida

Key Projects

- Participation in Cooperative NRDA for the phosphate patch in Idaho (JR Simplot
- Use of habitat equivalency analysis in Grand River Ditch damage assessment (Water Supply and Storage Company)
- Use and critique of habitat equivalency analysis for petroleum refinery sites (confidential client)
- Services-based critiques of various groundwater damage assessments in New Jersey (ExxonMobil, Dow Chemical, and others)
- Environmental costing study to develop externality values for fossil fuel sources in resource planning (Xcel Energy)
- Critique of wetlands valuations study that employed benefits transfer using ecosystem services (Kean Miller)
- Critique of Trustee contingent valuation study of alleged aesthetic and ecological injuries in the Illinois River Watershed (Tyson Foods, Inc.)
- Assessment of potential recreation use losses in Illinois River Watershed (Tyson Foods, Inc.)
- Critique of the use of habitat equivalency analysis for historical mining site (Confidential Client)
- Prepared alternative natural resource damage estimates for key mining and smelting sites (ASARCO, Inc.)
- Groundwater damages at the South Valley Superfund Site in New Mexico (General Electric Company)
- Evaluation of the use of contingent valuation surveys to measure diminished property values in Mississippi (confidential client)
- Evaluation of market and survey-based methods for measuring damages from underground storage tanks (USTs) to both residential and commercial properties (confidential client)

- The role of individual factors in using market and survey-based methods for measuring potential damages to classes of residential properties in Colorado Springs, Colorado (Davis Graham Stubbs)
- The role of individual factors in using market and survey-based methods for measuring both residential and commercial properties in Oklahoma (confidential client)
- Comments on the benefit estimates of EPA's proposed Phase II 316(b) Rule (The Utility Water Act Group)
- Benefit-cost analysis of various regulatory alternatives for 316(b) compliance in Connecticut" (confidential client)
- Benefit-cost analysis of 316(b) regulatory alternatives in California (confidential client)
- Creel/angler survey on the Lower Passaic River (Tierra Solution)
- Review of New Jersey's groundwater damage assessment formula (New Jersey Site Remediation Industry Network)
- Environmental costs for particulate matter and mercury: an assessment of the recent literature (Xcel Energy)
- NRDA for a major waterway in the Northeast (confidential client)
- Alternative Santa Clara River HEA (confidential client)
- Saginaw Bay and River natural resource damage assessment (General Motors)
- Evaluating the reliability of contingent valuation (U.S. Environmental Protection Agency)
- Measuring environmental costs for resource planning (Northern States Power Company)
- Natural resource damage assessment for Lavaca Bay, Texas (Alcoa)
- Natural resource damage assessment for the Clark Fork Basin in Montana (ARCO)
- Using conjoint analysis to value health (Health Canada et al.)
- Wisconsin Energy Research Project (consortium of Wisconsin utilities)
- Fox River natural resource damage assessment (Fox River Group)
- Kalamazoo River natural resource damage assessment (Kalamazoo River Study Group)

- St. Lawrence River-Massena natural resource damage assessment (Reynolds, Alcoa, General Motors)
- Wisconsin externalities costing: principles & practices (Task Force on Externality Costing, Wisconsin utilities)
- Measuring benefits of the effluent guidelines: an evaluation of the benefits transfer technique (Office of Science and Technology, U.S. Environmental Protection Agency)
- Information, risk perception, and mitigation: behavioral responses to environmental risk (National Science Foundation)
- Natural resource damage assessments for the Martinez, California; Gasconade River, Missouri; and Arthur Kill, New Jersey Oil Spills (various clients)
- Communicating risk effectively (Office of Policy Planning and Evaluation, U.S. Environmental Protection Agency)
- Valuing reductions in hazardous waste risks (Office of Policy Analysis, U.S. Environmental Protection Agency)
- Evaluating risks of a high-level nuclear waste repository (State of Nevada)
- A comparison of benefit estimation approaches (Office of Policy Analysis, U.S. Environmental Protection Agency)

Expert Reports

- Expert Report of William H. Desvousges, Ph.D. in the Matter of *San Diego Unified Port District et al. vs. Monsanto Company, et al.* May 9, 2019.
- Expert Report of William H. Desvousges in the Matter of Matter of *Jay Burdick, Connie Plouffe, Edward Plouffe, Frank Seymour, Emily Marpe, as parent and natural guardian of E.B., an infant, and G.Y., an infant, Jacqueline Monette, William Sharpe, Edward Perroti-Sousis, Mark Denue, and Megan Dunn, individually, and on behalf of all similarly situated v. Tonoga, Inc. (d/b/a Taconic).* March 2018.
- Critique of Earth Economics Technical Report: Economic Valuation of Environmental Impacts Associated with Pipeline Canals Located on Vintage Assets, Inc. Property. In the Matter of *Vintage Assets, Inc. et al. v. Tennessee Gas Pipeline Company, LLC. No. 16-cv-00713, United States District Court, Eastern District of Louisiana.* April 20, 2017.
- Groundwater Assessment in the Matter of *State of Alaska and City of North Pole v. Williams Alaska Petroleum, Inc. et al*. December 14, 2016.

- Evaluation of the Adequacy of the Fox River NRD Settlements. September 2, 2016.

- Estimating Externality Values: The Damage Cost Approach. Prepared for: Xcel Energy. Prepared by: William H. Desvousges, H. Spencer Banzhaf, Holly J. Michael, Ralph E. Morris and Anne D. Chance. August 5, 2015.

- Critique of Mr. Daniel Selby's Letter Report on Punitive Damages for the Dunkard Creek September 2009 Event. In the Matter of *Commonwealth of Pennsylvania, Pennsylvania Fish and Boat Commission vs. Consol Energy, Inc., Consolidation Coal Company, and Winsor Coal Company. Civil Action No. 8 11-C-556*. April 6, 2015.

- Critique of the 2011 Pennsylvania Fish and Boat Commission Biological Damage Assessment for the Pennsylvania Portion of Dunkard Creek. In the Matter of *Commonwealth of Pennsylvania, Pennsylvania Fish and Boat Commission vs. Consol Energy, Inc., Consolidation Coal Company, and Winsor Coal Company. Civil Action No. 8 11-C-556*. February 27, 2015.

- Expert Report of William H. Desvousges, Ph.D. In the Matter of *New Jersey Department of Environmental Protection, et al. v. Exxon ST Services Terminal, Paulsboro, NJ.* May 2014.

- Non Site-Specific Expert Report of Dr. William H. Desvousges. In Re *MTBE Products Liability Litigation, Commonwealth of Puerto Rico, et al. v. Shell Oil Co., et al., 07-civ-10470.* January 22, 2014.

- Declaration of William H. Desvousges, Ph.D. in the Matter of *New Jersey Department of Environmental Protection vs. Exxon Mobil Corporation.* Superior Court of New Jersey. November 2013.

- Expert Report of William H. Desvousges, Ph.D. in the Matter of *Harris County v. International Paper Company, et al. (Harris County District Court Case No. 2011-76724); Dao Van Pho, et al. v. International Paper Company, et al. (Harris County District Court Case No. 2012-58016); Jim Harpster, et al. v. International Paper Company, et al. (Harris County District Court Case No. 2012-66308).* August 15, 2013.

- Expert Report of William H. Desvousges in the Matter of *the New Jersey Department of Environmental Protection, Commissioner of the New Jersey Department of Environmental Protection and the Administrator of the New Jersey Spill Compensation Fund v. Atlantic Richfield Company, et al.* February 8, 2013.

- Affidavit of William H. Desvousges, Ph.D. in the Matter of *Commissioner of the Department of Planning and Natural Resources, et al. v. Century Aluminum Company, et al.* Civil No. 2005-0062.

- Reply Affidavit of William H. Desvousges, Ph.D. in the *Matter of Thomas H. Ivory, Thomas P. Ivory, Shawn (Ivory) Stevens, Tami Lynn (Ivory) Azouri, Emmanuel Odom, Grace Odom, and James Odom v. International*

Business Machines Corporation. Supreme Court of the State of New York, Country of Broome. June 20, 2012.

- Expert Rebuttal Report in the Matter of *Commissioner of the Department of Planning and Natural Resources, Alicia V. Barnes, et al. v. Virgin Islands Alumina Co., et al*. May 30, 2012

- Affidavit of William H. Desvousges, Ph.D. in the *Matter of Thomas H. Ivory, Thomas P. Ivory, Shawn (Ivory) Stevens, Tami Lynn (Ivory) Azouri, Emmanuel Odom, Grace Odom, and James Odom v. International Business Machines Corporation.* Supreme Court of the State of New York, Country of Broome. May 1, 2012.

- Expert Report of William H. Desvousges, Ph.D. In the *Matter of Betty Jean Cole, et al. v. Asarco Incorporated, et al.* July 29, 2011.

- Critique of Dr. Barnthouse's Report: Estimation of Natural Resource Losses Related to Oil Field Development in the Concession in the Case of *Maria Aguinda y Otros v. Chevron Corporation*. September 28, 2010.

- Expert Report of William H. Desvousges, Ph.D. In the Matter of *New Jersey Department of Environmental Protection, et al. v. Union Carbide Corporation, et al.* August 13, 2010.

- Expert Report in the Matter of *The Quapaw Tribe of Oklahoma, et al. v. Blue Tee Corp, et al.* June 25, 2010.

- Expert Report in the Matter of *New Jersey Department of Environmental Protection, et al. v. Essex Chemical Corporation.* Superior Court of New Jersey Law Division - Middlesex County Docket No: MID-L-5685-07. January 8, 2010.

- Expert report in the Matter of *DeLeo, et al. v. Bouchard Transportation Co., et al.* December 15, 2009.

- Expert report in the Matter of *Abrams, et al. v. Ciba Specialty Chemicals Corp, et al.* The United States District Court Southern District Of Alabama. CASE NO. 08-68-WS-B. May 15, 2009.

- Rebuttal expert report in the Matter of *Robert C. Brandriff, et al. v. Dataw Island Owners' Association, Inc., et al.* Civil Action No. 9:07-3361-CWH. April 27, 2009.

- Expert report in the Matter of *STATE OF OKLAHOMA, ex. rel. W.A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT, J.D. Strong, in his capacity as the TRUSTEE FOR NATURAL RESOURCSE FOR THE STATE OF OKLAHOMA, Plaintiffs v. TYSON FOODS, INC., TYSON POULTRY, INC., TYSON CHICKEN, INC., COBB-VANTRESS, INC., AVIAGEN, INC.,CAL-MAINE FOODS, INC., CAL-MAINE , FARMS, INC., CARGILL, INC., CARGILL TURKEY PRODUCTION, LLC, GEORGE'S INC., GEORGE'S FARMS, INC.,*

PETERSON FARMS, INC., SIMMONS FOODS INC., and WILLOW BROOK FOODS, INC., Defendants. Case No. 05-CV-329-GKF-PJC. March 31, 2009.

- Report prepared in Response to Request for Comments on Regulatory Review Alternatives: The Value of Cost-Benefit Analysis. Utility Water Act Group. March 31, 2009.

- Expert report in the Matter of *Robert C. Brandriff, et al. v. Dataw Island Owners' Association, Inc., et al.* Civil Action No. 9:07-3361-CWH. December 1, 2008.

- Affidavit of William H. Desvousges, Ph.D. in the Matter of *Jeff Alban, et al. v. ExxonMobil Corporation, et al.* Submitted to the In Circuit Court for Baltimore County. Case No.:03-C-06-010932

- Affidavit of William H. Desvousges, Ph.D. in Support of Defendants' Opposition to Motion for Class Certification in the Matter of *Murray Gintis, Victoria Gintis and Claudia Martin on behalf of themselves and all others similarly situated v. Bouchard Transportation Company, Inc., Tug Evening Tide Corporation and B. NO. 120 Corporation*. Submitted to the United States District Court for the District of Massachusetts. Civil Action No. 06-10747-JLT. July 29.

- Expert Report of William H. Desvousges, Ph.D. Submitted in Support of Defendants' Opposition to Plaintiffs' Motion for Partial Summary Judgment in the Matter of *Murray Gintis, Victoria Gintis and Claudia Martin on behalf of themselves and all others similarly situated v. Bouchard Transportation Company, Inc., Tug Evening Tide Corporation and B. NO. 120 Corporation*. July 10.

- Rebuttal Expert Report of William H. Desvousges, Ph.D. in the Matter of *USA v. Water Supply & Storage*. October 24, 2007.

- Expert Report of William H. Desvousges, Ph.D. in the Matter of *USA v. Water Supply & Storage*. September 27, 2007.

- Expert Reports in the Matter of *Official Committee of Unsecured Creditors v. ASARCO LLC (In re ASARCO LLC), Case No. 05-21207.*

    - Estimate of Environmental Liabilities. California Gulch Superfund Site. Leadville, Colorado. Prepared by ENVIRON International Corporation, Chicago, Illinois and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. May 4, 2007.

    - Estimate of Environmental Liabilities. Bunker Hill Superfund Facility/Coeur d'Alene Basin. Idaho/Washington. Prepared by ENVIRON International Corporation Chicago, Illinois and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. June 15, 2007.

- Estimate of Environmental Liabilities. Tacoma Smelter Site. Tacoma, Washington. Prepared by ENVIRON International Corporation Chicago, Illinois and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. June 15, 2007.

- Estimate of Environmental Liabilities. Everett Smelter Site. Everett, Washington. Prepared by ENVIRON International Corporation Chicago, Illinois and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. June 15, 2007.

- Rebuttal Expert Report. California Gulch Superfund Site. Leadville, Colorado. Prepared for Milbank, Tweed, Hadley & McCloy LLP. On behalf of ASARCO Incorporated. Prepared by ENVIRON International Corporation Chicago, Illinois and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. June 22, 2007.

- Estimate of Environmental Liabilities. Nueces Bay/Corpus Christi Bay. Corpus Christi, Nueces County, Texas. Prepared by ENVIRON International Corporation St. Peters, Missouri and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. July 27, 2007.

- Estimate of Environmental Liabilities. Big River Mine Tailings and Federal Mine Tailings Sites. St. Francois County, Missouri. Prepared by ENVIRON International Corporation St. Peters, Missouri and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. July 27, 2007.

- Estimate of Environmental Liabilities. Catherine Mine Site/Madison County Mines Site. Madison County, Missouri. Prepared by ENVIRON International Corporation St. Peters, Missouri and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. July 27, 2007.

- Estimate of Environmental Liabilities. Glover Lead Facility. Glover, Missouri. Prepared by ENVIRON International Corporation St. Peters, Missouri and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. July 27, 2007.

- Estimate of Environmental Liabilities. Sweetwater Mine Site. Reynolds County, Missouri. Prepared by ENVIRON International Corporation St. Peters, Missouri and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. July 27, 2007.

- Estimate of Environmental Liabilities. West Fork Mine Site. Reynolds County, Missouri. Prepared by ENVIRON International Corporation St. Peters, Missouri and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. July 27, 2007.

- Estimate of Environmental Liabilities. Tar Creek Site. Ottawa County, Oklahoma. Prepared by ENVIRON International Corporation St. Peters, Missouri and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. July 27, 2007.

- Estimate of Environmental Liabilities. Cherokee County Superfund Site. Cherokee County, Kansas. Prepared by ENVIRON International Corporation St. Peters, Missouri and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. July 27, 2007.

- Estimate of Environmental Liabilities. Newton County Mine Tailings Site. Newton County, Missouri. Prepared by ENVIRON International Corporation St. Peters, Missouri and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. July 27, 2007.

- Estimate of Environmental Liabilities. Jasper County Superfund Site. Jasper County, Missouri. Prepared by ENVIRON International Corporation St. Peters, Missouri and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. On behalf of ASARCO Incorporated. July 27, 2007.

- Rebuttal Expert Report. Bunker Hill Superfund Facility/Coeur d'Alene Basin. Idaho/Washington. Prepared for Milbank, Tweed, Hadley & McCloy LLP. On behalf of ASARCO Incorporated. Prepared by W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. August 10, 2007.

- Rebuttal Expert Report. Tacoma Smelter Site. Tacoma, Washington. Prepared for Milbank, Tweed, Hadley & McCloy LLP. On behalf of ASARCO Incorporated. Prepared by ENVIRON International Corporation Chicago, Illinois and W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. August 14, 2007.

- Rebuttal Expert Report. Nueces Bay/Corpus Christi Bay Corpus Christi, Nueces County, Texas. Prepared for Milbank, Tweed, Hadley & McCloy LLP. On behalf of ASARCO Incorporated. Prepared by W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. September 17, 2007.

- Rebuttal Expert Report. Tri-State Sites. Prepared for Milbank, Tweed, Hadley & McCloy LLP. On behalf of ASARCO Incorporated. Prepared by W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. September 17, 2007.

- Rebuttal Expert Report. East Helena Superfund Site, East Helena, Montana. Prepared for Milbank, Tweed, Hadley & McCloy LLP. On behalf of ASARCO Incorporated. Prepared by W.H. Desvousges & Associates, Inc. Raleigh, North Carolina. November 2, 2007.

- Expert Report in the Matter of *New Jersey Department of Environmental Protection and Acting Administrator, New Jersey Spill Compensation Fund v. Higgins Disposal, et al.* March 16, 2006.
- Expert Report in the Matter of *New Jersey Department of Environmental Protection and Acting Administrator, New Jersey Spill Compensation Fund v. Exxon Mobil Corporation, et al.* March 3, 2006.
- Expert Affidavit of William H. Desvousges In Support Of Defendant's Opposition To Plaintiffs' Motion For Partial Summary Judgment in the Matter of *New Jersey Department of Environmental Protection and Administrator New Jersey Spill Compensation fund v. Exxon Mobil Corporation*. February 17, 2006.
- Expert Report in the Matter of *Fisher, et al. v. Ciba Corporation.* February 15, 2006.
- Expert Report in the Matter of *Perrine, et al. v. E.I. DuPont De Nemours and Company, et al*. February 3, 2006.
- Expert Report in the Matter of *Estate of David Hill, et al. v. Koppers Industries, Inc., et al.* January 26, 2006.
- Second Expert Report in the Matter of *Allgood, et al. v. General Motors Corporation.* September 29, 2005.
- Expert Report in the Matter of *Jackson, et al. v. Johnson Electric Automotive, Inc., et al.* August 15, 2005.
- Expert Report in the Matter of *Beck, et al. v. Koppers Industries, Inc., et al.* August 1, 2005.
- Declaration of William H. Desvousges, Ph.D. Pursuant to 28 U.S.C. § 1746. April 15, 2005.
- Supplemental Report in the Matter of *Palmisano, et al. v. Olin Corporation*. February 7, 2005.
- Expert Report in the Matter of *Allgood, et al. v. General Motors Corporation.* January 17, 2005.
- Expert Report in the Matter of *LaBauve, et al. v. Olin Corporation.* December 10, 2004.
- Expert Report in the Matter of *Cole, et al. v. ASARCO, et al*. August 23, 2004.
- Expert Report in the Matter of *Daniels, et al. v. Olin Corporation*. August 16, 2004.
- Expert Report in the Matter of *Kellum, et al. v. Kuhlman Corporation, et al*. July 2003.

- Expert Report in the Matter of *Susann Stalcup, et al. v. Schlage Lock Company, et al*. April 1, 2003.
- Expert Report in the Matter of *Muise/Tzannetakis, et al. v. GPU Energy*. December 2, 2002.
- Expert Report in the Matter of *State of New Mexico v. General Electric Company, et al.* February 1, 2002.
- Expert Report in the Matter of *Major Andrews, et al. v. Kerr-McGee Corporation, Inc., et al*. June 29, 2001.
- Expert Report: *Volume I: Critique of the State of Montana's Contingent Valuation Study*. 1995. Submitted to United States District Court, District of Montana, Helena Division in the Matter of *State of Montana v. Atlantic Richfield Company*. Case No. CV-83-317-HLN-PGH.
- Expert Report: *Volume II: Critique of the State of Montana's Recreation Study*. 1995. Submitted to United States District Court, District of Montana, Helena Division in the Matter of *State of Montana v. Atlantic Richfield Company*. Case No. CV-83-317-HLN-PGH.
- Expert Report of William H. Desvousges and Steven M. Waters: *Volume III: Report on Potential Economic Losses Associated with Recreation Services in the Upper Clark Fork River Basin*. 1995. Submitted to United States District Court, District of Montana, Helena Division in the Matter of *State of Montana v. Atlantic Richfield Company*. Case No. CV-83-317-HLN-PGH.
- Expert Report: *Volume IV: Critique of the State of Montana's Groundwater Valuation*. 1995. Submitted to United States District Court, District of Montana, Helena Division in the Matter of *State of Montana v. Atlantic Richfield Company*. Case No. CV-83-317-HLN-PGH.
- Expert Report: *Volume V: Report on Potential Economic Losses Associated with Groundwater*. 1995. Submitted to United States District Court, District of Montana, Helena Division in the Matter of *State of Montana v. Atlantic Richfield Company*. Case No. CV-83-317-HLN-PGH.
- Expert Report of William H. Desvousges and Steven M. Waters: *Volume VI: Additional Economic Critique of the State of Montana's Damage Estimates*. 1995. Submitted to United States District Court, District of Montana, Helena Division in the Matter of *State of Montana v. Atlantic Richfield Company*. Case No. CV-83-317-HLN-PGH.

Testimony

Provided expert witness testimony in the Matter of *State of Alaska and City of North Pole v. Williams et al*. In the Superior Court for the State of Alaska Fourth Judicial District at Fairbanks Case No. 4FA-14-01544 CI. October 22, 2019.

Provided expert witness deposition testimony in the Matter of *San Diego Unified Port District et al. vs. Monsanto Company, et al.* July 11, 2019.

Provided expert witness deposition testimony in the Matter of *Vintage Assets, Inc. et al. v. Tennessee Gas Pipeline Company, LLC. No. 16-cv-00713, United States District Court, Eastern District of Louisiana.* June 14, 2017.

Provided expert witness deposition testimony in the Matter of *State of Alaska and City of North Pole v. Williams et al*. In the Superior Court for the State of Alaska Fourth Judicial District at Fairbanks Case No. 4FA-14-01544 CI. March 7, 2017.

Provided expert witness deposition testimony in the Matter of *United States of America and the State of Wisconsin v. NCR Corporation, et al.* In The United States District Court for the Eastern District of Wisconsin Green Bay Division. Civil Action No. 10-C-910. October 26, 2016.

Provided expert witness testimony in the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minnesota Statues Section 216B.2422, Subdivision 3. State of Minnesota. Office of Administrative Hearings for the Public Utilities Commission. January 2016. Additional testimony provided to the Minnesota Public Utilities Commission. July 25 and 27, 2017.

Provided expert witness testimony in the Matter of *New Jersey Department of Environmental Protection and Administrator, New Jersey Spill Compensation Fund v. Exxon Mobil Corporation.* June 2014.

Provided expert witness deposition testimony in the Matter of the *New Jersey Department of Environmental Protection, Commissioner of the New Jersey Department of Environmental Protection and the Administrator of the New Jersey Spill Compensation Fund v. Atlantic Richfield Company, et al.* May 7 and 8, 2013.

Provided expert witness deposition telephonic deposition in the *Matter of Betty Jean Cole, et al. v. Asarco Incorporated, et al.* September 8, 2011.

Provided expert witness testimony In the *Matter of New Jersey Department of Environmental Protection, et al. v. Union Carbide Corporation, et al.* October 2010.

Provided expert witness deposition testimony In the *Matter of New Jersey Department of Environmental Protection, et al. v. Union Carbide Corporation, et al.* September 9, 2010.

Provided expert witness deposition testimony in the Matter of *The Quapaw Tribe of Oklahoma, et al. v. Blue Tee Corp, et al.* The United States District Court For The Northern District Of Oklahoma. Case No. 03-CV-0846-CVE-PJC. June 29, 2010.

Provided expert witness testimony in the Matter of *DeLeo, et al. v. Bouchard Transportation Co., et al.* March 30, 2010.

Provided expert witness testimony in the Matter of *New Jersey Department of Environmental Protection, et al. v. Essex Chemical Corporation*. Superior Court of New Jersey Law Division - Middlesex County Docket No: MID-L-5685-07. March 25, 2010.

Provided expert witness telephonic deposition testimony in the Matter of *Abrams, et al. v. Ciba Specialty Chemicals Corp, et al.* The United States District Court Southern District Of Alabama. CASE NO. 08-68-WS-B. St. Augustine, FL. June 15, 2009.

Provided expert witness deposition testimony in the Matter of *STATE OF OKLAHOMA, ex. rel. W.A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT, J.D. Strong, in his capacity as the TRUSTEE FOR NATURAL RESOURCSE FOR THE STATE OF OKLAHOMA, Plaintiffs v. TYSON FOODS, INC., TYSON POULTRY, INC., TYSON CHICKEN, INC., COBB-VANTRESS, INC., AVIAGEN, INC.,CAL-MAINE FOODS, INC., CAL-MAINE , FARMS, INC., CARGILL, INC., CARGILL TURKEY PRODUCTION, LLC, GEORGE'S INC., GEORGE'S FARMS, INC., PETERSON FARMS, INC., SIMMONS FOODS INC., and WILLOW BROOK FOODS, INC. Defendants.* Case No. 05-CV-329-GKF-PJC. May 14, 2009.

Provided expert witness deposition testimony in the *Matter of Robert C. Brandriff, et al. v. Dataw Island Owners' Association, Inc., et al.* Civil Action No. 9:07-3361-CWH. April 2009.

Provided expert witness deposition testimony in the *Matter of USA v. Water Supply & Storage*. November 28, 2007.

Provided expert witness deposition testimony in the *Matter of Official Committee of Unsecured Creditors v. ASARCO LLC (In re ASARCO LLC), Case No. 05-21207.* Bunker Hill Superfund Facility/Coeur d'Alene Basin. Idaho/Washington. Settlement Hearing. October 9-12, 2007.

Provided expert witness testimony in the *Matter of Official Committee of Unsecured Creditors v. ASARCO LLC (In re ASARCO LLC), Case No. 05-21207.* Bunker Hill Superfund Facility/Coeur d'Alene Basin. Idaho/Washington. Deposition. September 26, 2007.

Provided expert witness testimony in the *Matter of Official Committee of Unsecured Creditors v. ASARCO LLC (In re ASARCO LLC), Case No. 05-21207.* California Gulch Superfund Site Settlement Hearing. July 27, 2007.

Provided expert witness testimony in the *Matter of Official Committee of Unsecured Creditors v. ASARCO LLC (In re ASARCO LLC), Case No. 05-21207.* California Gulch Superfund Site Deposition. July 24, 2007.

Provided expert witness testimony in the Matter of *New Jersey Department of Environmental Protection and Acting Administrator, New Jersey Spill Compensation Fund v. Exxon Mobil Corporation, et al.* March 28, 2006.

Provided expert witness testimony in the Matter of *Fisher, et al. v. Ciba Corporation.* March 2, 2006.

Provided expert witness deposition testimony in the Matter of *Allgood, et al. v. General Motors Corporation.* February 15, 2006.

Provided expert witness deposition testimony in the Matter of *Palmisano, et al. v. Olin Corporation.* February 23, 2005.

Provided expert witness deposition testimony in the Matter of *LaBauve, et al. v. Olin Corporation.* Civil No. 03-567 in the U.S. District Court, Southern District of Alabama. February 14, 2005.

Provided expert witness deposition testimony in the Matter of *Betty Jean Cole, et al. v. ASARCO Incorporated, et al.* Case No. 03-CV-327(H) M in the U.S. District Court, Northern District of Oklahoma. October 8, 2004.

Provided expert witness deposition testimony in the Matter of *Daniels, et al. and Palmisano, et al. v. Olin Corporation, et al*. Case No. C 03-01211 RMW in the U.S. District Court, Northern District of California, San Jose Division. September 21 and 22, 2004 and February 23, 2005.

Provided expert witness testimony and participated in Daubert hearing in the Matter of *State of New Mexico v. General Electric Company, et al.* Case No. CIV 99-1254, Case No. CIV 99-1118. Consolidated by Order dated June 14, 2000. January 2004.

Provided testimony to the Public Service Commission of Wisconsin in the Matter of "Application of Wisconsin Electric Power Company; Wisconsin Energy Corporation; and W.E. Power, LLC for a Certificate of Public Convenience and Necessity for Construction of Three Large Electric Generation Facilities, the Elm Road Generating Station, and Associated High Voltage Transmission Interconnection Facilities to be Located in Milwaukee and Racine Counties. Docket No. 05-CE-130. September 8, 2003.

Provided expert witness deposition testimony in the Matter of *Kellum, et al. v. Kuhlman Corporation, et al*. Civil Action No. 2001-0313 through 2001-324 in the Circuit Court of Copiah County, Mississippi. August 19 and August 20, 2003.

Provided expert witness deposition testimony in the Matter of *Susann Stalcup, Craig Lewis and Sharon Lewis v. Schlage Lock Company, Ingersoll-Rand Company and Eagle-Picher Industries, Inc.* Case No. 02-RB01188(OES). June 12, 2003.

Provided expert witness deposition testimony in the Matter of *Mary Louise Fairey, et al. v. the Exxon Corporation, Standard Oil Company, et al.* Case No. 94-CP-38-118. March 13 and June 3, 2003.

Provided expert witness deposition testimony in the Matter of *Muise/Tzannetakis, et al. v. GPU Energy.* January 22, 2003.

Provided expert witness deposition testimony in the Matter of *Andrews, et al. v. Kerr-McGee Corporation, et al.* Civil Action No. 1:00-CV-00158-B-A in the U.S. District Court, Northern District of Mississippi, Eastern Division. October 16, 2001.

Provided expert witness deposition testimony in the Matter of *State of New Mexico v. General Electric Company, et al.* Case No. CIV 99-1254, Case No. CIV 99-1118. Consolidated by Order dated June 14, 2000.

Provided expert witness deposition testimony in the Matter of *State of Montana v. Atlantic Richfield Company* in the U.S. District Court, District of Montana, Helena Division. Case No. CV-83-317-HLN-PGH. July 13, 1995. Rebuttal Testimony provided February 1, 1996.

Provided testimony on the Matter of "The Role of Contingent Valuation in Natural Resource Damage Assessment" before the U.S. House of Representatives Subcommittee on Commerce, Trade, and Hazardous Materials. June 20, 1995.

Provided testimony before the Public Utilities Commission of the State of Minnesota in the Matter of "The Quantification of Environmental Costs." Docket No. E-999/CI-93-583. Testimony in November 1994. Rebuttal in March 1995, and Sur-rebuttal in April 1995.

Testified before the National Oceanic and Atmospheric Administration (NOAA) Contingent Valuation Panel in the Matter of "Using CV to Measure Nonuse Damages: An Assessment of Validity and Reliability." August 12, 1992.

Provided testimony to Wisconsin Public Service Commission in the Matter of "Accounting for Environmental Externalities in Electric Utility Planning." November 26, 1991.

Areas of Specialization

Property Valuation

Prepared expert report that critiqued reports provided by the plaintiff's economic experts in a lawsuit alleging groundwater contamination at a Superfund site in the western U.S. Created a sophisticated hedonic property value model demonstrating that the Superfund site had no effect on residential property values.

Performed statistical analyses of changes in property values as a result of mandatory membership in a golf club.

In several states, directed projects evaluating the use of surveys to measure diminished property values, commercial and residential property values, potential damages to residential and commercial properties, and potential damages from various contaminants.

Critiqued the contingent valuation survey of a plaintiff's expert in a series of lawsuits alleging property damages caused by a wood-treating facility in Mississippi. Demonstrated that the survey is unreliable for use in litigation.

Natural Resource Damage Assessment

Assisted in NRD assessment for a process-water release (Mosaic).

Performed and critiqued habitat equivalency analysis studies.

Prepared assessment of proposed changes to DOI NRDA rules.

Developed comprehensive assessment plans for complex assessments for a wide range of sites.

Performed preliminary assessments for both oil-spill and hazardous-waste sites.

Designed state-of-the-art studies to measure potential losses for recreation and groundwater services. Studies included data-collection protocols and implementation.

Performed critical analyses of studies that used contingent valuation to measure nonuse values.

Designed and directed studies to measure potential recreation losses and to evaluate potential restoration gains.

Critiqued the transfer study used by the plaintiff's expert in a Louisiana lawsuit seeking restoration funds to convert floatant freshwater marsh habitat to uplands. Provided an alternative estimate of the value of the wetlands.

Benefit/Cost Analysis

Prepared comments on EPA's Proposed Survey to Estimate the Potential Benefits of Alternative Cooling Water Intake Policies for the Utility Water Act Group. Prepared in conjunction with NERA Consulting Group. September 2010.

Prepared comments to Office of Management and Budget on potential revisions to benefit cost analyses of governmental regulations for the Utility Water Act Group.

Prepared comments on economic issues in EPA's proposed 316(b) regulations for The Utility Water Act Group.

Directed a benefit analysis of technology-based effluent guidelines for municipal and industrial dischargers.

Directing projects to measure benefits of 316(b) regulatory alternatives for several utility clients

Served on peer review committee associated with benefits transfer data needs for Environment Canada.

Served as peer reviewer on benefits transfer for Ontario Ministry of the Environment.

Directed a feasibility study of using benefit-cost techniques to assist in the planning of estuaries cleanup. The study used case studies of two estuaries: the Albemarle and Pamlico Sounds.

Prepared a handbook on benefit-cost assessment for water programs that included chapters on measuring benefits and costs, selecting a discount rate, and assembling a benefit-cost assessment.

Compared alternative approaches for estimating the recreation and related benefits of the Monongahela River in Pennsylvania. Developed a survey questionnaire to measure recreation, user, option, and existence benefits for different levels of water quality. The survey design enabled a comparison of bidding games, direct-question, and contingent-ranking techniques for measuring benefits. Used clustered sampling techniques to sample 393 households, and compared the direct survey results with benefits estimates derived from an indirect estimation technique.

Survey Design and Management

During the past 25 years, designed and managed large-scale surveys. Experienced in using bidding games, direct-question, contingent-ranking, and discrete-choice techniques for measuring benefits of natural resource and environmental policies. Directed focus groups to determine appropriate terminology, to evaluate the effectiveness of alternative visual aids used in the surveys, and to assess the various survey issues. Developed surveys to evaluate the following:

- Health benefits from reduced cardiac and respiratory morbidity using conjoint analysis
- Market penetration for "green" products using conjoint analysis
- Customer willingness to pay for "greener" electricity using conjoint analysis
- The role of quality-of-life measures in the benefits of improved life extension

- Natural resource damages
- Risk-communication effectiveness
- Radon risk perceptions and willingness to pay to reduce perceived risks
- Benefits of hazardous waste management regulations
- Risk perceptions related to the proposed siting of a nuclear waste repository and willingness to pay to reduce those perceived risks
- Recreation benefits demand
- Recreation, user, and option benefits for different levels of water quality

Environmental Costing

Provided analysis and testimony for the eastern Wisconsin utilities in hearings on environmental costing before the Wisconsin Public Service Commission.

Estimated the environmental externality costs of resource planning options for the eastern Wisconsin utilities and for Northern States Power.

Estimated the environmental externality costs of resource planning options for Xcel Energy updating study completed twenty years earlier.

Participated in environmental costing workshop and served on peer review committee for Ontario Hydro.

Health Economics

Conducted focus groups and used verbal protocols to develop stated-preference conjoint survey questionnaires.

Conducted large-scale stated-preference conjoint survey to measure benefits of reduced cardiac and respiratory morbidity.

Designed/conducted pilot study of quality of life and enhanced longevity using conjoint stated-preference methods.

Designed and distributed radon information materials that were sent to 2,000 homeowners in the state of New York who had their homes tested for radon. Supervised interviews with homeowners, sequenced over a nine-month to two-year period, to elicit their perceptions of radon risks and tracked any expenditure decisions to reduce these risks. The expenditures were used to estimate a willingness-to-pay measure of the value of reductions in radon risks. The research design also evaluated the effectiveness of an information policy for reducing radon risks.

Developed and evaluated alternative approaches for encouraging Maryland homeowners to test for radon. Developed and pretested risk communication materials that ranged from radio public service announcements to public

display posters and brochures. Used a three-community experimental design with 1,500 baseline and follow-up interviews in each community to measure effectiveness.

Professional Associations

- American Economic Association
- Association of Environmental and Resource Economists (AERE)
- Associate Member, Appraisal Institute
- Member of Nominating Committee for AERE, 1983 and 1986

Honors and Awards

- Recipient, 2019 Distinguished Alumnus, Florida State University – The College of Social Sciences and Public Policy
- Recipient, Research Triangle Institute Professional Development Award, 1985
- Nominated for Outstanding Young Man of Rolla, Missouri, 1979
- Outstanding Teacher Award, University of Missouri at Rolla, 1977 to 1979
- Scholar-Diplomat, U.S. State Department, 1978
- Graduated *cum laude*, Stetson University, 1972

Professional Leadership

- Vice President, Association of Environmental and Resource Economists, 1992 to 1994
- Associate Editor, *International Journal of Energy Studies*, 1989 to 1993
- Associate Editor, *Journal of Environmental Economics and Management*, 1992 to 1994
- Associate Editor, *Water Resources Research*, 1984 to 1987

Journals and Book Reviews

- *Journal of the National Academy of Sciences*
- *American Economic Review*
- *Review of Economics and Statistics*

- *Land Economics*
- *Journal of Environmental Economics and Management*
- *Growth and Change*
- *American Journal of Agricultural Economics*
- *Southern Economics Journal*
- *Mansfield's Principles of Microeconomics*
- *Marine Resource Economics*
- *National Science Foundation*
- *Journal of the American Statistical Association*

Publications

Desvousges, William, Nicholas Gard, Holly Michael, and Anne Chance. 2018. "Habitat and Resource Equivalency Analysis: A Critical Assessment." *Ecological Economics* 143: 74 – 89.

Desvousges, William, Kristy Mathews and Kenneth Train. 2016. "Reply to 'On the adequacy of scope test results: Comments on Desvousges, Mathews, and Train.'" *Ecological Economics.* 130: 361 – 362.

Desvousges, William, Kristy Mathews, and Kenneth Train. 2016. "From Curious to Pragmatically Curious: Comment on "From Hopeless to Curious? Thoughts on Hausman's 'Dubious to Hopeless' Critique of Contingent Valuation." *Applied Economic Perspectives and Policy* 38(1): 174 – 182.

Desvousges, William, Kristy Mathews, and Kenneth Train. 2015. "An Adding-Up Test on Contingent Valuations of River and Lake Quality" *Land Economics.* 91(3): 556 – 571.

Snyder, Joan P. and William H. Desvousges, Ph.D. 2013. "Habitat and Resource Equivalency Analyses in Resource Compensation and Restoration Decision Making." *Natural Resources & Environment Journa*l, American Bar Association Section of Environment, Energy and Resources 28(1): 3-7.

Gard, Nicholas W. and William H. Desvousges. 2013. "Technical and economic issues an practices in ELD application." In *The EU Environmental Liability Directive: A Commentary,* Lucas Bergkamp and Barbara J. Goldsmith, Eds. Oxford, UK: Oxford University Press.

Desvousges, William, Kristy Mathews, and Kenneth Train. 2012. "Adequate Responsiveness to Scope in Contingent Valuation." *Ecological Economics* 84: 121-128.

Desvousges, William, Johnston, F. Reed, Richard W. Dunford, Kevin J. Boyle, Sarah P. Hudson, and K. Nicole Wilson. 2010. *Measuring Nonuse Damages Using Contingent Valuation: An Experimental Evaluation of Accuracy* (2nd. Ed). Research Triangle Park, NC: RTI International Press.

MacNair, D.J. and W.H. Desvousges. 2007. "The Economics of Fish Consumption Advisories: Insights from Revealed and Stated Preference Data." *Land Economics* 83(4): 600-616.

Mathews, K.E., M.L. Freeman, and W.H. Desvousges. 2006. "How and How Much? The Role of Information in CE Questionnaires." In *Valuing Environmental Amenities Using Stated Choice Studies*, Barbara Kanninen, ed. Boston: Kluwer Academic Publishers.

Kinnell, J.C., M.F. Bingham, A.F. Mohamed, W.H. Desvousges, T.B. Kiler, E.K. Hastings, and K.T. Kuhns. 2006. "Estimating Site-Choice Decisions for Urban Recreators." *Land Economics* 82(2):257–272.

Dunford, R.W., T.C. Ginn, and W.H. Desvousges. 2004. "The Use of Habitat Equivalency Analysis in Natural Resource Damage Assessments." *Ecological Economics* 48(1):49–70.

Mathews, K.E., and W.H. Desvousges. 2003. "Stigma Claims and Survey Reliability: Lessons Learned from Natural Resource Damages Litigation." *Journal of Forensic Economics* 16(1):23–36.

Iannuzzi, T.J., D.F. Ludwig, J.C. Kinnell, J.M. Wallin, W.H. Desvousges, and R.W. Dunford. 2002. *A Common Tragedy: History of an Urban River*. Amherst, MA: Amherst Scientific Publishers.

Mathews, K.E., K.J. Gribben, and W.H. Desvousges. 2002. "Integration of Risk Assessment and Natural Resource Damage Assessment: A Case Study of Lavaca Bay." In *Human and Ecological Risk Assessment: Theory & Practice,* Dennis J. Paustenbach, ed. New York: John Wiley and Sons.

Johnson, F.R., R.W. Dunford, W.H. Desvousges, and H.S. Banzhaf. 2001. "The Role of Knowledge in Assessing Nonuse Damages: A Case Study of the Lower Passaic River." *Growth and Change* 32(Winter):43–68.

Smith, V. Kerry, Donald H. Taylor, Jr., Frank A. Sloan, F. Reed Johnson, and William H. Desvousges. 2001. "Do Smokers Respond to Health Shocks?" *The Review of Economics and Statistics* 83(4):675–687.

Desvousges, W.H., and J.C. Lutz. 2000. "Compensatory Restoration: Economic Principles and Practice." *Arizona Law Review* 42(2):411–432.

Johnson, F.R., M.R. Banzhaf, and W.H. Desvousges. 2000. "Willingness to Pay for Improved Respiratory and Cardiovascular Health: A Multiple-Format Stated-Preference Approach." *Health Economics* 9:295–317.

Payne, J.W., D.A. Schkade, W.H. Desvousges, and C. Aultman. 2000. "Valuation of Multiple Environmental Programs." *Journal of Risk and Uncertainty* 21(1):95–115.

Desvousges, William H., Erin E. Fries, Sara P. Hudson, and Richard W. Dunford. 1999. "Scaling and Selecting Compensatory Restoration Projects: An Economic Perspective." Chapter 2 in Restoration of Lost Human Uses of the Environment. Ed. G. Cecil. Pensacola, FL: SETAC Press. 61–85.

Mathews, Kristy E., William H. Desvousges, F. Reed Johnson, and Melissa C. Ruby. 1999. "Using Economic Models to Inform Restoration Decisions: The Lavaca Bay, Texas Experience." Chapter 8 in Restoration of Lost Human Uses of the Environment. Ed. G. Cecil. Pensacola, FL: SETAC Press. 317-336.

Desvousges, W.H., F.R. Johnson, and H.S. Banzhaf. 1998. *Environmental Policy Analysis With Limited Information: Principles and Applications to the Transfer Method.* Cheltenham, UK: Edward Elgar.

Johnson, F.R., W.H. Desvousges, M.C. Ruby, D. Stieb, and P. De Civita. 1998. "Eliciting Stated Health Preferences: An Application to Willingness to Pay for Longevity." *Medical Decision Making* 18(2):57–67.

Johnson, F.R., and W.H. Desvousges. 1997. "Estimating Stated Preferences With Rated-Pair Data: Environmental, Health, and Employment Effects of Energy Programs." *Journal of Environmental Economics and Management* 34(1):79–99.

Banzhaf, H.S., W.H. Desvousges, and F.R. Johnson. 1996. "Assessing the Externalities of Electricity Generation in the Midwest." *Resource and Energy Economics* 18:395–421.

Boyle, K.J., F.R. Johnson, D.W. McCollum, W.H. Desvousges, R.W. Dunford, and S.P. Hudson. 1996. "Valuing Public Goods: Discrete Versus Continuous Contingent-Valuation Responses." *Land Economics* 72(3):381–96.

Desvousges, W.H., S.P. Hudson, and M.C. Ruby. 1996. "Evaluating CV Performance: Separating the Light From the Heat." In *The Contingent Valuation of Environmental Resources: Methodological Issues and Research Needs*, D.J. Bjornstad and J.R. Kahn, eds. Brookfield, VT: Edward Elgar Publishing Limited.

Smith, V.K., W.H. Desvousges, and J.W. Payne. 1995. "Do Risk Information Programs Promote Mitigating Behavior?" *Journal of Risk and Uncertainty* 10:203–221.

Wood, L.L., A.E. Kenyon, W.H. Desvousges, and L.K. Morander. 1995. "How Much Are Customers Willing to Pay for Improvements in Health and Environmental Quality?" *The Electricity Journal* May: 70-77.

Boyle, K.J., W.H. Desvousges, F.R. Johnson, R.W. Dunford, and S.P. Hudson. 1994. "An Investigation of Part-Whole Biases in Contingent Valuation Studies." *Journal of Environmental Economics and Management* 27(1):64–83.

Desvousges, W.H., H. Kunreuther, P. Slovic, and E.A. Rosa. 1993. "Perceived Risk and Attitudes Toward Nuclear Wastes: National and Nevada Perspectives." In *Public Reactions to Nuclear Waste*, R. Dunlap, M. Kraft, and E.A. Rosa, eds. Durham, NC: Duke University Press.

Desvousges, W.H., F.R. Johnson, R.W. Dunford, K.J. Boyle, S.P. Hudson, and K.N. Wilson. 1993. "Measuring Natural Resource Damages With Contingent Valuation: Tests of Validity and Reliability." In *Contingent Valuation, A Critical Assessment*, J.A. Hausman, ed., pp. 91–164. Amsterdam: Elsevier.

Desvousges, W.H., A.R. Gable, R.W. Dunford, and S.P. Hudson. 1993. "Contingent Valuation: The Wrong Tool for Damage Assessment." *Choices* 8(2):9–11.

Desvousges, W.H., V.K. Smith, and H.H. Rink, III. 1992. "Communicating Radon Risks Effectively: The Maryland Experience." *Journal of Public Policy and Marketing* 11(1):68–78.

Desvousges, W.H., and R.W. Dunford. 1992. "Russian River Basin Formaldehyde Release." In *Natural Resource Damages: Law and Economics*, K.M. Ward and J.W. Duffield, eds. New York: John Wiley and Sons.

Desvousges, W.H., M. Naughton, and G. Parsons. 1992. "Benefits Transfer: Conceptual Problems in Estimating Water Quality Benefits Using Existing Studies." *Water Resources Research* 28(3):675–683.

Kunreuther, H., D. Easterling, W.H. Desvousges, and P. Slovic. 1990. "Public Attitudes Toward Siting a High-Level Nuclear Waste Repository in Nevada." *Risk Analysis* 10(4):469–484.

Smith, V.K., and W.H. Desvousges. 1990. "Risk Communication and the Value of Information: Radon as a Case Study." *Review of Economics and Statistics* 72(1):137–140.

Smith, V.K., W.H., Desvousges, F.R. Johnson, and A. Fisher. 1990. "Can Public Information Programs Affect Risk Perceptions?" *Journal of Policy Analysis and Management* 9(1):41–59.

Desvousges, W.H., and J.H. Frey. 1989. "Integrating Focus Groups and Surveys: Examples from Environmental Risk Studies." *Journal of Official Statistics* 5(4):1–15.

Smith, V.K., and W.H. Desvousges. 1989. "Subjective Versus Technical Risk Estimates: Do Risk Communication Policies Increase Consistency?" *Economic Letters* 31:287–291.

Desvousges, W.H., and V.K. Smith. 1988. "Focus Groups and Risk Communication: The 'Science' of Listening to Data." *Risk Analysis* 8(4):479–484.

Smith, V.K., and W.H. Desvousges. 1988. "Risk Perception, Learning and Individual Behavior." *American Journal of Agricultural Economics* 70(5):1113–1117.

Kunreuther, H., W.H. Desvousges, and P. Slovic. 1988. "Nevada's Predicament: Public Perceptions of Risk From the Proposed Nuclear Waste Repository." *Environment* 30(8):17–20, 30–33.

Smith, V.K., and W.H. Desvousges. 1988. "The Valuation of Environmental Risks and Hazardous Waste Policy." *Land Economics* 64(3):211–219.

Smith, V.K., W.H. Desvousges, A. Fisher, and F.R. Johnson. 1988. "Learning About Radon's Risk." *Journal of Risk and Uncertainty* 1:233–258.

Johnson, F.R., A. Fisher, V.K. Smith, and W.H. Desvousges. 1988. "Informed Choice or Regulated Risks? Lessons From a Social Experiment in Risk Communication." *Environment* 30(4):12–15, 30–35. Reprinted in *Readings in Risk.* 1990. Washington, DC: Resources for the Future.

Desvousges, W.H., V.K. Smith, A. Fisher, and F.R. Johnson. 1988. "Communicating Radon Risks Effectively." In *Managing Environmental Risks, Proceedings of Air Pollution Control Association, Specialty Conference on Risk Management and Risk Communication.* Pittsburgh, PA.

Smith, V.K., and W.H. Desvousges. 1987. "An Empirical Analysis of the Economic Value of Risk Changes." *Journal of Political Economy* 95(1):89–114.

Desvousges, W.H., V.K. Smith, and A. Fisher. 1987. "Option Price Estimates for Water Quality Improvements: A Contingent Valuation Study for the Monongahela River." *Journal of Environmental Economics and Management* 14:248–267.

Smith, V.K., and W.H. Desvousges. 1986. *Measuring Water Quality Benefits*. Boston: Kluwer Nijhoff.

Smith, V.K., and W.H. Desvousges. 1986. "Asymmetries in the Valuation for Risk Reductions." *American Economic Review* 76(2):291–294.

Smith, V.K., and W.H. Desvousges. 1986. "The Value of Avoiding a LULU: Hazardous Waste Landfill Sites." *Review of Economics and Statistics* 68(2):293–299.

Smith, V.K., and W.H. Desvousges. 1986. "Averting Behavior: Does It Exist?" *Economic Letters* 20:291–296.

Smith, V.K., W.H. Desvousges, and A. Fisher. 1986. "A Comparison of Direct and Indirect Methods for Estimating Environmental Benefits." *American Journal of Agricultural Economics* 68:280–289.

Smith, V.K., and W.H. Desvousges. 1985. "The Generalized Travel Cost Model and Water Quality Benefits: A Reconsideration." *Southern Economic Journal* 52(2):371–381.

Smith, V.K., and W.H. Desvousges. 1984. "Measuring the Benefits of Water Quality Improvements: Additional Considerations." *Southern Economic Journal* October.

Desvousges, W.H., and M.J. Piette. 1984. "Problems and Prospects: Outer Continental Shelf Petroleum Resources." *Growth and Change* 15(2):3–10.

Desvousges, W.H. 1984. "Benefit Cost Assessment of the Toulumne River: A Foreword." *Environmental Defense Fund*, Spring.

Desvousges, W.H., V.K. Smith, and A. Fisher. 1983. "Estimates of the Option Values for Water Quality Improvements." *Economic Letters* 13:81–86.

Smith, V.K., W.H. Desvousges, and M.P. McGivney. 1983. "Estimating Water Quality Benefits: An Econometric Analysis." *Southern Economic Journal* 50(2):422–437.

Smith, V.K., W.H. Desvousges, and M.P. McGivney. 1983. "The Opportunity Cost of Travel Time in Recreation Demand Models." *Land Economics* 59(3):259–278.

Piette, M.J., and W.H. Desvousges. 1981. "Behavior of the Firm: The U.S. Petroleum Pipeline Industry Under Regulatory Constraint." *Growth and Change* 12(2):17–22.

Garbacz, C., and W.H. Desvousges. 1980. "The Impact of Increased Energy Costs on Municipal Budgets in Missouri." *Missouri Municipal League Review*, July.

Desvousges, W.H., and M.J. Piette. 1979. "The Effect of 'Large' Mergers on Concentration Trends in Petroleum Production: 1955–1975." *Southern Economic Journal*, October.

Desvousges, W.H. 1978. *Tourism U.S.A. Volume 1: Appraising Tourism Potential.* United States Department of Commerce, United States Travel Service, Washington, D.C.

Desvousges, W.H. 1978. "Savannah, Georgia." *Profiles in Tourism U.S.A., 1978*. United States Department of Commerce, United States Travel Service, Washington, D.C.

Foreyt, J.P., C.E. Rockwood, J.C. Davis, W.H. Desvousges, and R. Hollingsworth. 1975. "Benefit-Cost Analysis of a Token Economy Program." *Professional Psychology* February.

Selected Reports and Working Papers

Peer Review for the EPA 316(b) Rule § 122.21 (r)(10), (r)(11), and(r)(12) studies on the cooling water intake structure (CWIS) at the Alcoa Power Generating Inc. (APGI) Warrick Power Plant located in Newburgh, Indiana. January 2018.

Peer Review for the EPA § 122.21 (r)(10), (r)(11), and(r)(12) studies on its cooling water intake structure (CWIS) at the Northern States Power – Minnesota High Bridge Combined Cycle Plant. January 2018.s

Peer Review of Kahe Generating Station § 316(b) § 122.21(r) Information. March 7, 2017.

Peer Review of Waiau Generating Station § 316(b) § 122.21(r) Information. November 15, 2016.

The Aluminum Association, BP America, Inc., The Dow Chemical Company, Exxon Mobil Corporation, General Electric Company, and National Mining Association. 2008. "Comments on The United States Department of the Interior's Notice of Proposed Rulemaking on Revisions of Its Type B Procedures for Natural Resource Damage Assessments" (73 Fed.Reg. 11081, February 29, 2008). May 29. (Appendix B: Comments on Proposed Changes to DOI Rule.)

Desvousges, W.H. 2006. "Letter to Steve Glomb at the U.S. Department of Interior re: Proposed DOI Changes." December 15.

Desvousges, W.H. and H.J. Michael. 2006. "Response to the Department of the Interior's Questions to FACA Subcommittee #3." Prepared for Department of the Interior FACA Subcommittee #3. June 2. Raleigh, NC: W.H. Desvousges & Associates, Inc.

Desvousges, W.H., M.F. Bingham, J.C. Kinnell, A.F. Mohamed, and K.T. Kuhns. 2005. *Review and Response to the EPA's Response to Comments from the American Chemistry Council et al. and Accompanying Triangle Economic Research (TER) Report*. Prepared for the Utility Water Act Group, General Electric Company, American Chemistry Council, American Forest and Paper Association, American Iron and Steel Institute, American Public Power Association, and American Petroleum Institute. April 20. Durham, NC: Triangle Economic Research.

Desvousges, W.H., M.F. Bingham, J.C. Kinnell, and A.F. Mohamed. 2005. *Comments on Potential Nonuse Values for Proposed Phase III Cooling Water Intake Regulations: Final Report*. Prepared for the Utility Water Act Group, American Chemistry Council, American Forest and Paper Association, American Iron and Steel Institute, American Petroleum Institute, and American Public Power Association. January 24. Durham, NC: Triangle Economic Research.

Mathews, K.E., and W.H. Desvousges. 2004. *Stigma Claims and Survey Reliability: Lessons Learned from Natural Resource Damages Litigation.* Working Paper No. T-0401. Durham, NC: Triangle Economic Research.

Bingham, M.F, W.H. Desvousges, and A.F. Mohamed. 2003. *Comments on Benefit Estimation of EPA's Proposed Phase II 316(b) Rule as Summarized in the Notice of Data Availability: Final Report*. Prepared for The Utility Water Act Group. Durham, NC: Triangle Economic Research. June 2.

Mathews, K.E., and W.H. Desvousges. 2002. "The Truth, the Partial Truth, or Anything But the Truth: Survey Reliability and Property Valuation." Paper presented at the Symposium on Environmental & Property Damages: Standards, Due Diligence, Valuation & Strategy, Toronto, Ontario. April 4–6.

Desvousges, W.H., D.M. Clark, M.F. Bingham, A.F. Mohammed, S.M. Small, and D.F. Ludwig. 2002. *Comments on the Benefit Estimates of EPA's Proposed Phase II 316(b) Rule: Final Report.* Prepared for the Utility Water Act Group.

Desvousges, W.H., J.C. Kinnell, K.S. Lievense, and E.A. Keohane. 2001. *Passaic River Study Area Creel/Angler Survey: Data Report.* TER Working Paper No. G-0101. Durham, NC: Triangle Economic Research.

Desvousges, W.H., D.J. MacNair, F.R. Johnson, G.A. Smith, and S.D. Cox. 2000. *Comments on the Federal Trustees' Restoration Scaling and Compensable Value Determination for the Fox River/Green Bay*. Durham, NC: Triangle Economic Research.

Desvousges, W.H., D.J. MacNair, and G.A. Smith. 2000. *Lower Fox River and Green Bay: Assessment of Potential Recreational Fishing Losses and Restoration Offsets*. Durham, NC: Triangle Economic Research.

Desvousges, W.H., R.W. Dunford, K.E. Mathews, C.L. Taylor, and J.L. Teague. 1999. *A Preliminary Economic Evaluation of New Jersey's Proposed Groundwater Damage Assessment Process.* Report prepared for New Jersey Site Remediation Industry Network.

Johnson, F.R., Melissa C. Ruby, William H. Desvousges, and Jonathan R. King. 1998. *Using Stated Preferences and Health-State Classifications to Estimate the Value of Health Effects of Air Pollution.* Report

prepared for Environment Canada, Health Canada, Ontario Hydro, and Ontario Ministry of Environment and Energy.

Desvousges, W.H., F. Reed Johnson, M.C. Ruby, and Alicia R. Gable. 1997. *Valuing Stated Preferences for Health Benefits of Improved Air Quality: Results of a Pilot Study.* TER Working Paper No. T-9702. Durham, NC: Triangle Economic Research.

Dunford, R.W., W.H. Desvousges, F.R. Johnson, E.E. Fries, H.J. Michael, and K.E. Mathews. 1997. *Comments on NOAA's Draft Compensatory Restoration Guidance Document.* Submitted to National Oceanic and Atmospheric Administration, Silver Spring, MD.

Dunford, R.W., A.R. Gable, S.P. Hudson, W.H. Desvousges, and F.R. Johnson. 1996. *A Review of the 1996 Contingent Valuation Study on the Value of Preventing Oil Spills Along California's Central Coast*. Prepared for Ad Hoc Industry Group. Durham, NC: Triangle Economic Research.

Desvousges, W.H., F.R. Johnson, S.P. Hudson, A.R. Gable, and Melissa C. Ruby. 1996. *Using Conjoint Analysis and Health-State Classifications to Estimate the Value of Health Effects of Air Pollution: Pilot Test Results and Implications.* Prepared for Environment Canada, Health Canada, Ontario Hydro, Ontario Ministry of Environment and Energy, and Quebec Ministry of Environment. Durham, NC: Triangle Economic Research.

Desvousges, W.H., S.M. Waters, and K.E. Train. 1996. *Supplemental Report on Potential Economic Losses Associated with Recreation Services in the Upper Clark Fork River Basin*. Durham, NC: Triangle Economic Research.

Dunford, R.W., K.E. Mathews, A.R. Gable, E.E. Fries, F.R. Johnson, and W.H. Desvousges. 1995. *Nonuse Values for Nonenvironmental Commodities: Preliminary Contingent Valuation Results for Avoiding Job Losses.* Prepared for the U.S. Department of Energy. Durham, NC: Triangle Economic Research.

Dunford, R.W., K.E. Mathews, A.R. Gable, E.E. Fries, F.R. Johnson, and W.H. Desvousges. 1995. *Nonuse Values for Nonenvironmental Commodities: Preliminary Conjoint Survey Results.* Prepared for the U.S. Department of Energy. Durham, NC: Triangle Economic Research.

Gable, A.R., W.H. Desvousges, and F.R. Johnson. 1995. *Calibrating Contingent Valuation Estimates: A Review of the Literature and Suggestions for Future Research.* Prepared for the U.S. Department of Energy. Durham, NC: Triangle Economic Research.

Mathews, K.E., F.R Johnson, R.W. Dunford, and W.H. Desvousges. 1995. *The Potential Role of Conjoint Analysis in Natural Resource Damage*

Assessments. TER Working Paper No. G-9503. Durham, NC: Triangle Economic Research.

Desvousges, W.H. 1995. *The Role of Contingent Valuation in Natural Resource Damage Assessment.* TER Working Paper No. G-9502. Durham, NC: Triangle Economic Research.

Desvousges, W.H., K.E. Mathews, R.W. Dunford, R.R. Russell, and H.L. James. 1995. *Comments on NOAA's Proposed NRDA Rule Under the Oil Pollution Act.* Submitted to NOAA. Durham, NC: Triangle Economic Research.

Desvousges, W.H., K.E. Mathews, R.W. Dunford, R.R. Russell, and H.L. James. 1995. *Comments on NOAA's Proposed NRDA Rule Under the Oil Pollution Act: Executive Summary.* Durham, NC: Triangle Economic Research.

Desvousges, W.H., and R.A. Sandefur. 1995. "Modeling Natural Resource Damages for Spills and Releases of Oils and Chemicals." White Paper prepared for API by Arthur D. Little and Triangle Economic Research.

Desvousges, W.H., L.A. Sturtevant, S.E. Holden, and S.P. Hudson. 1995. *Review of DOI's Proposed NRDAM/CME and Associated Regulations.* Prepared by Arthur D. Little, Inc. and Triangle Economic Research.

Desvousges, W.H., S.P. Hudson, A.R. Gable, and S.K. Snow. 1995. *Review of DOI's Proposed NRDAM/GLE and Associated Regulations.* Prepared by Arthur D. Little, Inc., and Triangle Economic Research.

Desvousges, W.H., F.R. Johnson, H.S. Banzhaf, R.R. Russell, E.E. Fries, K.J. Dietz, S.C. Helms, D. Keen, J. Snyder, H. Balentine, V. Sadeghi, and S.A. Martin. 1995. *Assessing Environmental Externality Costs for Electricity Generation in Wisconsin.* Prepared for Wisconsin Task Force on Externality Costing. Seven volumes. Durham, NC: Triangle Economic Research.

Desvousges, W.H., F.R. Johnson, H.S. Banzhaf, R.R. Russell, E.E. Fries, K.J. Dietz, S.C. Helms, D. Keen, J. Snyder, H. Balentine, V. Sadeghi, and S.A. Martin. 1995. *Assessing Environmental Externality Costs for Electricity Generation.* Prepared for Northern States Power Company. Seven volumes. Durham, NC: Triangle Economic Research.

Johnson, F.R., W.H. Desvousges, E.E. Fries, and L.L. Wood. 1995. *Conjoint Analysis of Individual and Aggregate Environmental References*. TER Technical Working Paper No. T-9502. Durham, NC: Triangle Economic Research.

Desvousges, W.H., R.W. Dunford, R.R. Russell, and S.P. Hudson. 1994. *Review of Technical Memorandum: Quantification and Scaling of Resource Services.* Prepared for ASARCO Incorporated, Champion International Corporation, Kaiser Aluminum & Chemical Corporation, Occidental Chemical Corporation, and the City of Tacoma.

Desvousges, W.H., F.R. Johnson, and H. Spencer Banzhaf. 1994. *Assessing Environmental Costs For Electricity Generation.* TER General Working Paper No. G-9402. Durham, NC: Triangle Economic Research.

Desvousges, W.H., S.P. Hudson, S.K. Snow, R.W. Dunford, A.R. Gable, M.C. Ruby, and R.A. Sandefur. 1994. *Comments on the National Oceanic and Atmospheric Administration's Natural Resource Damage Assessment Proposed Rule.* Prepared for NOAA. Durham, NC: Triangle Economic Research.

Desvousges, W.H., L.L. Wood, A.E. Kenyon, F.R. Johnson, R. Iachan, and E.E. Fries. 1994. *Willingness-to-Pay Results and Market Penetration Forecasts.* Prepared for the Electric Power Research Institute.

Desvousges, W.H., S.P. Hudson, and R.R. Russell. 1993. *Comments on the Department of the Interior's Natural Resource Damage Assessment Proposed Rule.* Prepared for the Office of Environmental Affairs, U.S. Department of the Interior.

Desvousges, W.H., and F.R. Johnson. 1992. *A Review of "Methods for Measuring Nonuse Values: A Contingent Valuation Study of Groundwater Cleanup,"* by McClelland, Schulze, et al. Prepared for the Environmental Advisory Committee, U.S. Environmental Protection Agency.

Desvousges, W.H., F.R. Johnson, R.W. Dunford, K.N. Wilson, H.S. Banzhaf, and K.J. Stettler. 1992. *Using Contingent Valuation to Measure Nonuse Damages: An Assessment of Validity and Reliability.* Prepared for the NOAA Contingent Valuation Panel.

Desvousges, W.H., F.R. Johnson, R.W. Dunford, K.J. Boyle, S.P. Hudson, and K.N. Wilson. 1992. *Measuring Nonuse Damages Using Contingent Valuation: An Experimental Evaluation of Accuracy*. Monograph 92-1, Prepared for Exxon Company, USA. Research Triangle Park, NC: Research Triangle Institute.

Desvousges, W.H., K.E. Mathews, N. Dean, J.S. Smith, and K.N. Wilson. 1992. *Measuring Benefits of the Effluent Guidelines: An Evaluation of Benefits-Transfer Technique.* Prepared for the Office of Science and Technology, U.S. Environmental Protection Agency.

Desvousges, W.H., F.R. Johnson, J.A. Mauskopf, S.A. Johnston, J.S. Smith, K.N. Wilson, and M. Benerofe. 1991. *Accounting for Externality Costs in Wisconsin Electric Utility Planning.* Prepared for the Wisconsin Public Service Commission.

Desvousges, W.H., and A.J. Milliken. 1991. *An Economic Assessment of Natural Resource Damages from the Arthur Kill Oil Spill.* Prepared for Exxon Company, USA.

Desvousges, W.H., and R.W. Dunford. 1991. *Comments on the Proposed Revision in the NRDA Rule Pursuant to the 1989 Ohio vs. Interior Ruling.* Submitted to the U.S. Department of the Interior.

Robilliard, G.A., W.H. Desvousges, R.W. Dunford, and J. Milliken. 1991. *Natural Resource Injury and Damage Assessment Guidance Manual.* Prepared for the Petroleum Environmental Research Forum.

Regan, M.J., and W.H. Desvousges. 1990. *Communicating Environmental Risks: A Guide to Practical Evaluations.* Prepared for the U.S. Environmental Protection Agency.

Mauskopf, J.A., A. Forrest, and W.H. Desvousges. 1990. *Hazardous Substances in Our Environment: A Citizen's Guide to Understanding Health Risks and Reducing Exposure.* Prepared for the Risk Communication Program, U.S. Environmental Protection Agency.

Regan, M.J., J.L. Creighton, and W.H. Desvousges. 1990. *Sites for Our Solid Wastes: A Guidebook for Effective Public Involvement.* Prepared for the Office of Solid Waste, U.S. Environmental Protection Agency.

Desvousges, W.H., R.W. Dunford, and J.L. Domanico. 1989. *Measuring Natural Resource Damages: An Economic Appraisal.* Prepared for the American Petroleum Institute.

Desvousges, W.H., V.K. Smith, and H.H. Rink, III. 1988. *Communicating Radon Risk Effectively: Radon Testing in Maryland*. Prepared for the Office of Policy, Planning, and Evaluation, U.S. Environmental Protection Agency.

Desvousges, W.H., V.K. Smith, A. Fisher, and F.R. Johnson. 1987. *Communicating Radon Risks Effectively*. Cooperative Agreement report to the Office of Policy Analysis, U.S. Environmental Protection Agency.

Smith, V. Kerry, William H. Desvousges, Ann Fisher, and F. Reed Johnson. 1987. *Radon Risk Perceptions and Risk Communications: Preliminary Results.* Interim report prepared for the Office of Policy Analysis, U.S. Environmental Protection Agency.

Desvousges, W.H., R.W. Dunford, J. Frey, H. Kunreuther, R. Kasperson, and P. Slovic. 1987. *High-Level Nuclear Waste Repository Risks: Focus Group Findings and Implications for Surveys.* Prepared for Mountain West and the State of Nevada.

Desvousges, W.H., R.W. Dunford, and H.H. Rink, III. 1987. *The Social Cost of a Formaldehyde Release in the Russian River Basin.* Prepared for the U.S. Department of Justice.

Desvousges, W.H., R.W. Dunford, J. Frey, H. Kunreuther, R. Kasperson, and P. Slovic. 1986. *High Level Nuclear Waste Risk Surveys: Integrated Survey Plan.* Prepared for Mountain West and the State of Nevada.

Desvousges, W.H., and V.A. Skahen. 1986. *Techniques to Measure Damages to Natural Resources: Final Report.* Prepared for CERCLA 301 Task Force, U.S. Department of the Interior. Durham, NC: Research Triangle Institute.

Desvousges, W.H., and M.C. Naughton. 1985. *Water Quality Benefits of the BCT Regulations for the Pulp and Paper Industry.* Prepared for the Economic Analysis Division, U.S. Environmental Protection Agency.

Desvousges, W.H., and V.K. Smith. 1984. *The Travel Cost Approach for Valuing Improved Water Quality: Additional Considerations.* Prepared for the Economic Analysis Division, U.S. Environmental Protection Agency.

Desvousges, W.H., V.K. Smith, and M.P. McGivney. 1983. *A Comparison of Alternative Approaches for Estimating Recreation and Related Benefits of Water Quality Improvements.* Prepared for the Economic Analysis Division, U.S. Environmental Protection Agency.

Selected Presentations

Desvousges, W.H. 2016. "CV Estimates of Passive Use Values: Do the Numbers Add Up?" Law Seminars International's Natural Resource Damages Conference. Washington, D.C. March 11 – 12.

Desvousges, W.H. 2014. "Nonuse NRD Claim for Groundwater: A Case Study." The Eighth Annual Advanced Conference on Litigating Natural Resource Damages Santa Fe, New Mexico. July 24-25.

Desvousges, W.H. 2013. "Nonuse and Tribal NRD Claims: One Economists' Perspective." The Seventh Annual Comprehensive Conference on Natural Resource Damages Evolving Strategic and Tactical Issues. Santa Fe, New Mexico. July 19.

Desvousges, W.H. 2012. "Assessing Groundwater Damages: The Judge's Ruling." Panel Discussion. The Sixth Annual Advanced Conference on Litigating Natural Resource Damages. Santa Fe, New Mexico. July 12.

Desvousges, W.H. 2010. "Estimation of Restoration and Compensable Value Damages." Panel Discussion. Fourth Annual Natural Resource Damages Claims Conference. Santa Fe, New Mexico. July 16.

Desvousges, W.H. 2009. "Groundwater Valuation and Restoration: One Economist's Perspective." Third Annual Advanced Conference on Natural Resource Damages Litigation. Santa Fe, New Mexico. July 9.

Desvousges, W.H. 2008. "Natural Resource Damage Assessments: Economic Valuation of Natural Resource Damages." National Advanced Conference on Natural Resource Damages Litigation. Santa Fe, New Mexico. July 18.

Desvousges, W.H. 2007. "Natural Resource Damage Assessments: Key Economic Issues in Defending a Damages Claim." National Advanced Conference on Natural Resource Damages Litigation. Santa Fe, New Mexico. July 16.

Desvousges, W.H. 2007. "HEA and Conjoint Analysis Not Ready for Prime Time." Presentation at the U.S. Department of the Interior 2007 NRDA Restoration Program National Workshop. Phoenix, Arizona. April 26.

Desvousges, W.H. 2006. Presentation at the Office of Policy, Economics and Innovation's National Center for Environmental Economics and the Office of Solid Waste and Emergency Response's Land Revitalization Office workshop on Risk Assessment and Benefit Estimation Methods. Washington, D.C. September 28.

Desvousges, W.H. 2006. "Response to the Department of the Interior's Questions to FACA Subcommittee #3." Presented to Department of the Interior FACA Subcommittee #3, Shepherdstown, West Virginia, June 5.

Desvousges, W.H. 2005. "Compensatory Restoration Principles and Practices." Presented at the Natural Resource Damages Seminar, Cook College, New Brunswick, NJ. May 24.

Desvousges, W.H., and M.F. Bingham. 2004. "Benefit-Cost Analysis and 316(b) Compliance." Presented at the UWAG/EPRI (316(b) Legal Advisory Session, Atlanta, GA. May 12.

Desvousges, W.H., and K.E. Mathews. 2004. "Evaluating Mass Tort-Class Action Claims for Property Stigma Damages from Environmental Contamination." American Bar Association Conference on Environmental Law, Keystone, Colorado. March 11.

Kinnell, J.C., M.F. Bingham, E.A. Keohane, and W.H. Desvousges. 2002. "Using Intercept and Count Data to Estimate the Population of Anglers in an Urban and Industrial River." Presented at the 2002 W-133 Conference, Monterey, CA. February.

Kinnell, J.C., D.J. MacNair, and W.H. Desvousges. 2001. "Using RP and SP Data For Valuing Recreational Access in a Compensatory Restoration Framework." Presented at the 2001 W-133 Conference, Miami, FL. February.

MacNair, D.J., and W.H. Desvousges. 2001. "Using RP and SP Data to Measure the Effect of Fish Consumption Advisories on Recreational

Anglers." Presented at the 2001 W-133 Conference, Miami, FL. February.

Bingham, M.T., G. Smith, and W.H. Desvousges. 1999. "A Cognitive Approach to Modeling the WTP Decision Under Dichotomous Choice and Open-Ended Contingent-Valuation Survey Formats." Presented at the American Agricultural Economics Association Meeting, Nashville, Tennessee. August.

Kinnell, J.C., M.F. Bingham, and W.H. Desvousges. 1999. "Sequencing Effects in Valuing Multiple Environmental Programs." Presented at the American Agricultural Economics Association Meeting in Nashville, Tennessee. August.

Desvousges, W.H., and F.R. Johnson. 1998. "Measuring and Influencing Health-Related Attitudes, Perceptions, and Behavior." August.

Johnson, F.R., W.H. Desvousges, and M.J. Bingham. 1998. "Trade-off Preferences for Pharmaceuticals Development, Marketing, and Outcome Evaluation." Third international meeting of the International Society for Pharmacoeconomics and Outcomes Research, Philadelphia, PA. May.

MacNair, D.J., W.H. Desvousges, and J.C. Lutz. 1998. "An In-Kind Damage Assessment of Recreational Fishing Using Revealed and Stated Preference Data." The American Agricultural Economics Association Meeting, Salt Lake City, UT. August.

Desvousges, W.H. 1997. "Scaling and Selecting Compensatory-Restoration Projects: An Economic Perspective." Conference on Restoration of Lost Human Uses of the Environment, Washington, DC. May.

Desvousges, W.H. 1996. "NRDA From an Economist's Viewpoint." Blasland, Bouck and Lee, Inc. Sediment Management Seminar, Orlando, FL. February.

Fries, E.E., F.R. Johnson, K.E. Mathews, W.H. Desvousges, and R.W. Dunford. 1996. "The Consistency of Stated Preferences: An Analysis of Salmon-Preservation and Job-Loss Trade-offs." Camp Resources, Wilmington, N.C. August.

Johnson, F.R., M.C. Ruby, and W.H. Desvousges. 1996. "Valuing Stated Preferences for Health Benefits of Improved Air Quality: Results of a Pilot Study." Department of Economics at Stockholm School of Economics in Stockholm, Sweden. September.

Desvousges, W.H. 1995. "The Reliability of Contingent Valuation for NRDA." Panel Presentation at the Southern Economic Association Meetings in New Orleans, LA. November.

Johnson, F.R., W.H. Desvousges, and H.S. Banzhaf. 1995. "Assessing the Externalities of Electricity Generation in the Midwest." Southern Economic Association Meetings in New Orleans, Louisiana. November.

Desvousges, W.H., S.P. Hudson, and M.C. Ruby. 1994. "Evaluating CV Performance: Separating the Light from the Heat." DOE/EPA Workshop on Using Contingent Valuation to Measure Nonmarket Values, Herndon, VA. May.

Desvousges, W.H., and S.P. Hudson. 1994. "Contingent Valuation: Is it Accurate Enough for Damage Assessments?" American Bar Association Seminar on Natural Resource Damage Assessments, Chicago, IL. May.

Desvousges, W.H. 1993. "Using Contingent Valuation to Measure Nonuse Damages: A Lesson in Unreliability." Meeting of the Society for Environmental Toxicology and Chemistry, Houston, TX. November.

Robilliard, G.A., Fischel, W.H. Desvousges, R.W. Dunford, and K.E. Mathews. 1993. "Evaluation of Compensation Formulae to Measure Natural Resource Damages." International Oil Spill Conference, Tampa, FL. March.

Dunford, R.W., S.P. Hudson, and W.H. Desvousges. 1993. "Experimental Contingent Values for Reducing Environmental Damage from Oil Spills." International Oil Spill Conference, Tampa, FL. March.

Desvousges, W.H., R.W. Dunford, K.E. Mathews, and H.S. Banzhaf. 1993. "NRDA Case Study: The Arthur Kill Oil Spill." International Oil Spill Conference, Tampa, FL. March.

Desvousges, W.H., F.R. Johnson, R.W. Dunford, K.J. Boyle, and S.P. Hudson. 1993. "The Validity of Expressed Nonuse Values for Environmental Commodities." American Agricultural Economics Association meeting, Baltimore, MD. August.

Desvousges, W.H., F.R. Johnson, R.W. Dunford, K.J. Boyle, S.P. Hudson, and K.N. Wilson. 1992. "Measuring Natural Resource Damages with Contingent Valuation: Tests of Validity and Reliability." Cambridge Economics, Inc., symposium titled, "Contingent Valuation: A Critical Assessment." Washington, DC. April.

Dunford, R.W., and W.H. Desvousges. 1992. "Oil Spill Liability: Recent Legal and Economic Developments." American Economics Association meeting, New Orleans, LA. January.

Johnson, F.R., and W.H. Desvousges. 1991. "Nonuse Values in Natural Resource Damage Assessments." Southern Economic Association meeting, Nashville, TN. November.

Desvousges, W.H. 1991. "Valuing Ecological Risks." National Academy of Sciences Workshop on Ecological Risks, Warrenton, VA. February.

Dunford, R.W., S.P. Hudson, and W.H. Desvousges. 1991. "Linkages Between Oil Spill Removal Activities and Natural Resource Damages." Presented at the International Oil Spill Conference in San Diego, CA. March.

Desvousges, W.H. 1990. "Economics and the NRDA: One Economist's View." Workshop on Natural Resource Damages, American Bar Association, Washington, DC. May.

Desvousges, W.H. 1989. "Risk Perceptions and Nuclear Wastes." Engineering Foundation Conference on Risk Decision-Making, Santa Barbara, CA. October.

Desvousges, W.H., H. Kunreuther, and P. Slovic. 1989. "Perceived Risk and Nuclear Waste—A National and Nevada Perspective." American Association for the Advancement of Science Annual Meeting, San Francisco, CA. January.

Desvousges, W.H. 1987. "Hazardous Waste and Radon Risks: Good News and Bad News for Economists." Engineering Foundation Conference on Risk Management, Santa Barbara, CA. November.

Desvousges, W.H. 1987. "The Use of Focus Groups in Complex Environmental Surveys." American Association of Public Opinion Research Annual meeting, Hershey, PA.

Smith, V.K., and W.H. Desvousges. 1986. "Information and the Valuation of Risk Reductions," American Economics Association meeting, New Orleans, LA. December.

Desvousges, W.H. 1986. "Methods for Measuring Natural Resource Damages." Conference on Natural Resource Damages, Washington, DC. November.

Smith, V.K., and W.H. Desvousges. 1985. "Values for Risk Reductions: Some Considerations for Siting Decisions." American Economics Association meeting, New York, NY. December.